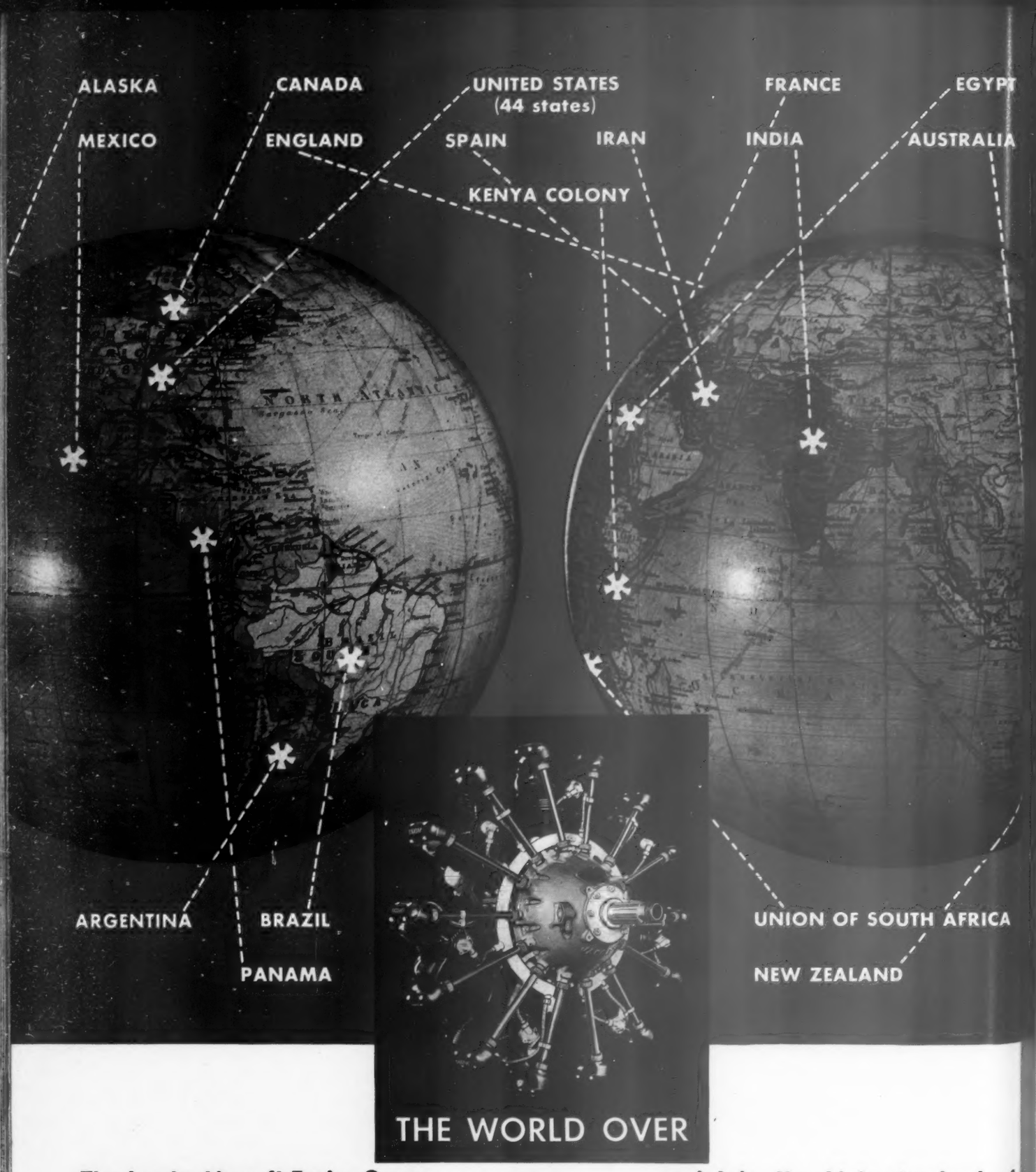
68 TWIN WASPS

For United Air Lines' New Fleet

New laurels for United Air Lines! Again they set the pace in commercial air transportation with their giant Douglas Mainliners . . . each ship powered by two TWIN WASPS. Over 1200 Pratt & Whitney twin row engines have already demonstrated their dependability in military and naval operation. Now they are bringing smoother performance and faster schedules to air travelers on America's famous Mainline.

PRATT & WHITNEY AIRCRAFT
EAST HARTFORD CONNECTICUT
Division of
UNITED AIRCRAFT CORPORATION



THE WORLD OVER

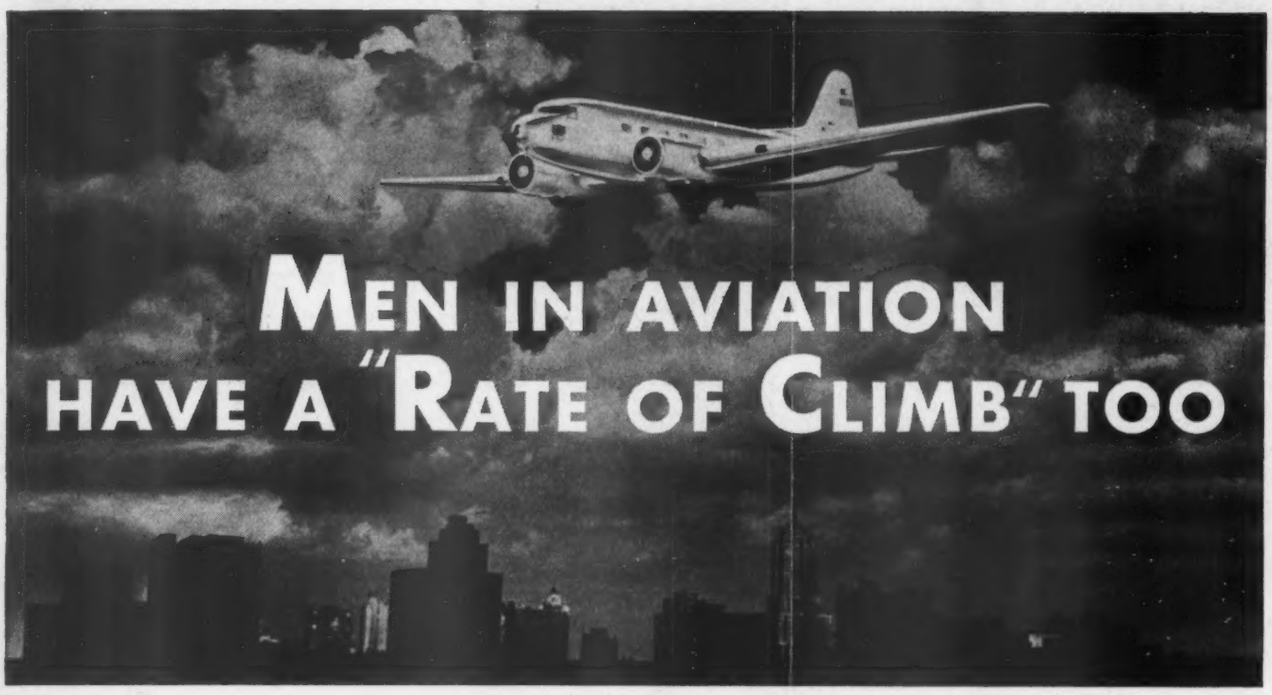
The Jacobs Aircraft Engine Co. extends its wishes for a prosperous 1937 to its 500-odd private and commercial users throughout the world—and pledges that it will maintain the high standard of quality of its products and its liberal service policy that have inured so greatly to the benefit of its users.

JACOBS AIRCRAFT ENGINES — EFFICIENT - RELIABLE

All places where the Jacobs Aircraft Engine Co. has a record of its engines being located are named on this map. If any countries or territories where Jacobs engines are located have been omitted, we hope they will consider themselves included in the greeting and will accept our apology for the omission.

JACOBS AIRCRAFT ENGINE COMPANY

POTTSTOWN • PENNSYLVANIA



Four times a year BOEING SCHOOL graduates about 50 young men, who have a definite advantage in the climb to success

THE ACID PROOF of any school is the success of its graduates.

So it is important to you to know this: although Boeing School has never promised to place graduates, 85% of the total number graduated during the last three years are on the way up in aviation!

These recent Boeing School graduates are forging ahead in every field—from scheduled transport pilots to radio and instrument technicians, from metals experts and aeronautical engineers to field managers and operations officials. With 28 major airline, aircraft and engine companies—from China to England!

There are solid reasons why Boeing School training gives you an "edge" in the fight for success. As a division of United Air Lines, this school has the benefit of more than 100 million miles of air transport experience. It benefits also by close contact with major builders of engines and aircraft.

Location, too, is important. At United's Pacific Coast terminus you are surrounded by actual air transport operations.

The school equipment includes 10 training planes; 15 factory-type shops and laboratories. Teaching staff numbers 30 experts in transport, flight, manufacturing and commercial problems. (An average of one instructor to every seven students! You get *more hours* of individual training.)

Next regular enrollment March 29

"AIRLINE PILOT and OPERATIONS" ...most famed of BOEING SCHOOL'S 15 "career" courses

The course for young men who wish to qualify as airline pilots—and rise to executive positions where flying ability and comprehensive technical training in all phases of aeronautics are primary requirements. Studies include 48 technical subjects; 250 hours dual and solo flying, advanced instrument and beam piloting, cross-country flight in 1350 h.p. transport. Most complete training available. Duration: 18 months. ONE OF SEVEN BOEING SCHOOL PILOT COURSES.

SEVEN GROUND COURSES . . . from 12-week "Aircraft Sheet Metals" and various radio and mechanics courses to 24-month "Air Transport" and "Practical Aeronautical" engineering courses. You benefit by *more hours of individual instruction* – Boeing School's staff includes 1/6 of all the licensed ground instructors in U. S. air schools!

1937 BOEING SCHOOL BULLETIN fully describes school and courses, tuition costs and convenient payment plans. Contains valuable guide to opportunities, qualifications, duties, lines of promotion. Bulletin will be sent free on request to prospective students and vocational counselors.

This coupon will bring you complete facts about Boeing School, courses which qualify you for flying and ground positions. Mail it today.

BOEING SCHOOL of AERONAUTICS A DIVISION OF UNITED AIR LINES

BOEING SCHOOL OF AERONAUTICS

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Please send BOEING SCHOOL BULLETIN without obligation to me. (I'm interested in courses checked):

- ☐ Airline Pilot and Operations
- ☐ Airline Operations
- ☐ Air Transport Engineering (*2 years pre-engineering required*)
- ☐ Transport (*or*) L. C. Pilot
- ☐ Airline Mechanic
- ☐ Practical Aeronautical Engineering (*2 years pre-engineering required*)
- ☐ Private (*or*) Amateur Pilot
- ☐ Aircraft Sheet Metal
- ☐ Non-scheduled Inst. Rating
- ☐ Airline Technician (*for engineering graduates only*)
- ☐ Airline Dispatching & Meteorology (*for engineering graduates only*)
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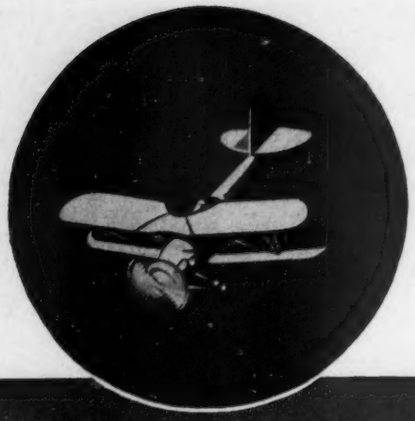
- ☐ Home Study Courses (*for those in the industry*)

*Name*_____ *Age*_____

*Years in High School*_____ *Years in College*_____ *Phone*_____

*P. O. Address*_____ *City*_____ *State*_____



For that Added Margin of Safety . . .

SHELBY *Seamless* **AIRCRAFT TUBING**

THERE can be no compromise with safety in aircraft construction — no substitute for pre-determined reliability. For all the skill of designer and builder may go for nothing if their materials fail them. Rigidity, fine balance, that added margin of safety, depend absolutely on the sturdiness of the tubular frame.

SHELBY Seamless Aircraft Tubing is the natural solution to this vitally important problem of framework construction. The light weight, high tensile strength, uniformity and durability of this superior steel tubing offer both designer and builder a service-tested material that combines maximum safety with lightness and superior strength. Its production is constantly safeguarded to maintain reliability. Every foot of SHELBY Seamless must pass through an intensive system of testing and inspection. Both physical and chemical properties are made to conform to the United States Army and Navy specifications.

Made by America's largest and most experienced manufacturer of mechanical tubing, SHELBY Seamless is available in chrome-molybdenum, mild carbon and stainless steels, both round* and streamline sections. Quick delivery from stock is assured by distributors located at convenient points throughout the country. And these stocks are carried in specific lots so that actual test reports which accompany shipments can be furnished for each lot at time of delivery.

* Round Tubing is also available in SHELBY "BF" Aircraft Tubing, which has an improved bright outside finish.

NATIONAL TUBE COMPANY

PITTSBURGH, PA.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

The Great Silver Fleet

NOW EVEN GREATER with 21 Passenger Douglas Airliners *Powered by* WRIGHT CYCLONES

Going South this Winter? Fly via "The Great Silver Fleet" now even GREATER by the addition of giant, new 21 passenger Douglas airliners, powered exclusively by Wright Cyclones. Eastern Air Lines' super-airliners provide the swiftest, most luxurious transportation to Florida and the Southland.

New E.A.L. schedules include four swift round trips daily between New York and Miami, and two round trips daily between Chicago and Miami, with extra sections, when required.

Eastern Air Lines' new "Pan American Express" speeds daily between New York and Miami in 7 hours and 40 minutes—with only one refueling stop at Charleston. These express flights connect with Pan American Airways' schedules to and from the West Indies and South America.

The powerful Wright Cyclone engines that will speed your trip to the Southland have had operating experience totaling 165,000,000 engine flight miles on airlines throughout the world. Aircraft engines of such proven dependability power "The Great Silver Fleet."

EASTERN AIR LINES

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NEW YORK - NEW ORLEANS - HOUSTON
CHICAGO - ATLANTA - MIAMI

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NEW YORK - WASHINGTON
14 Round Trips Daily

"Fly With Wright the World Over"

WRIGHT

AERONAUTICAL CORPORATION

PATERSON NEW JERSEY

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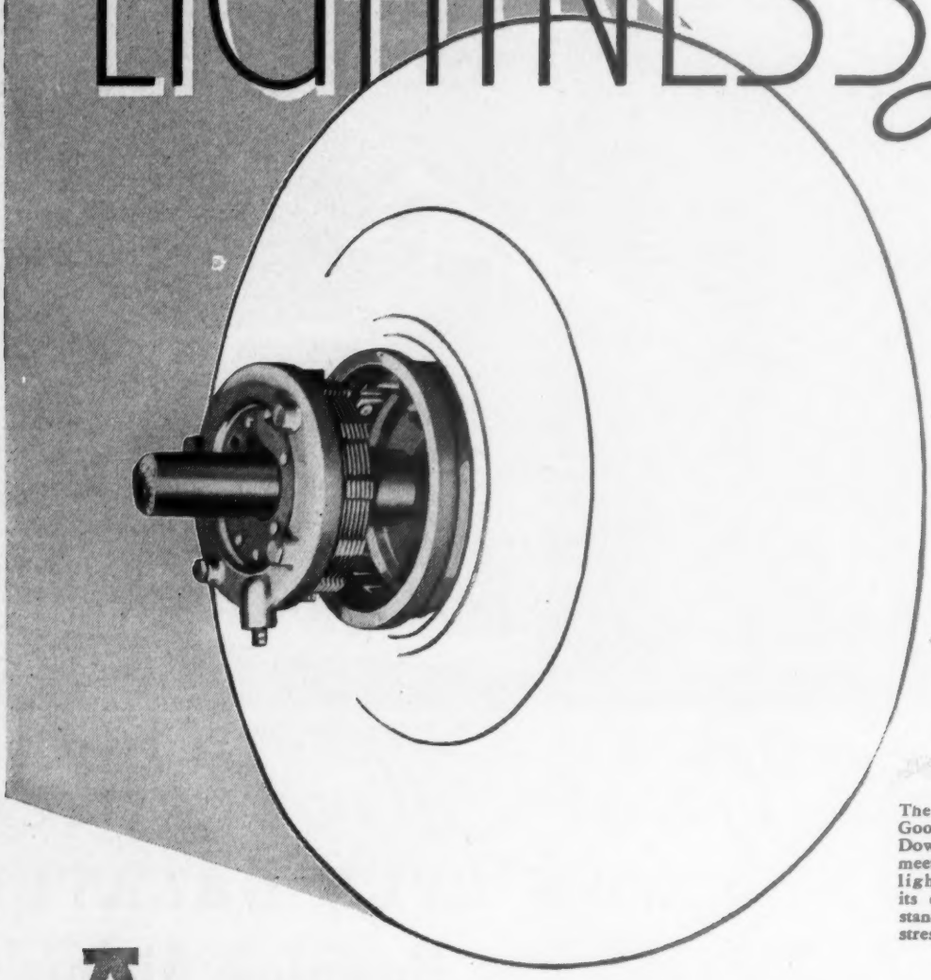
LIGHTNESS *Leads*

TO GREATER PAYLOAD CAPACITY!



The wheel and brake castings of the Goodyear Airwheel are entirely of Dowmetal. Here, where Dowmetal meets the demand for extreme lightness, it also demonstrates its exceptional strength in withstanding the most severe landing stresses and landing conditions.

And DOWMETAL leads in lightness

ALL OTHER PRACTICAL METALS!

The full import of Dowmetal's extreme lightness is registering all along the line of American industry.

Offering, as it does, a lightness advantage of a full third over aluminum, yet giving comparable strength and durability, Dowmetal is literally unique among metals.

In such products as foundry flasks, portable power tools and the famous Hoover Electric Cleaner it makes manual handling far easier. In air conditioning systems, bread wrapping-slicing machines, textile looms and presses, it gives equivalent or speedier operations with far lower power costs.

But, a front-rank value of Dowmetal is its contribution to larger payloads. For the past several years it has demonstrated its signal value in the field of aircraft. Today it is showing builders and users of trucks and buses how it can cut dead weight and greatly increase payload capacity.

Available in plate, sheet, forgings, sand or die-castings, standard and special extruded shapes, Dowmetal is ready to go into a variety of applications.

Familiarize yourself with Dowmetal —as a basic metal—as the world's lightest structural metal. Learn how it is going into low-cost, mass production. Especially, how it can come to the aid and betterment of the product you produce or equipment you use.

Write today for "The Dowmetal Data Book"—it gives the complete story, technically.

DOWMETAL

MAGNESIUM ALLOYS

LIGHTEST OF ALL STRUCTURAL METALS

THE DOW CHEMICAL COMPANY • *Dowmetal Division* • Midland, Michigan

Hundred Horsepower Hands!

● Only one pair of hands; but placed on the handle of a YALE Hand Lift Truck—they match the power of a hundred horses!

You can't wring profits from today's highly competitive markets with haphazard methods. It takes high-geared efficiency at low-geared cost to put the black ink in your ledgers . . . the kind of efficiency that a YALE Hand Lift Truck and Skid Platform System throughout your plant will give!

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* WE'LL BE GLAD TO SEND YOU NAMES OF INDUSTRIAL LEADERS EVERYWHERE WHO ARE SAVING TIME AND MONEY THE YALE TRUCK WAY

AVIATION—Yale equipment plays an important part in the handling of materials. Small parts are moved from one machine to another and to storage. The Yale "Planeveyor" helps to park sea planes in hangars.

SPEED ECONOMY **YALE** SAFETY EFFICIENCY

IN MATERIALS HANDLING

THE YALE & TOWNE MANUFACTURING COMPANY, PHILADELPHIA DIVISION, PHILADELPHIA, PA.

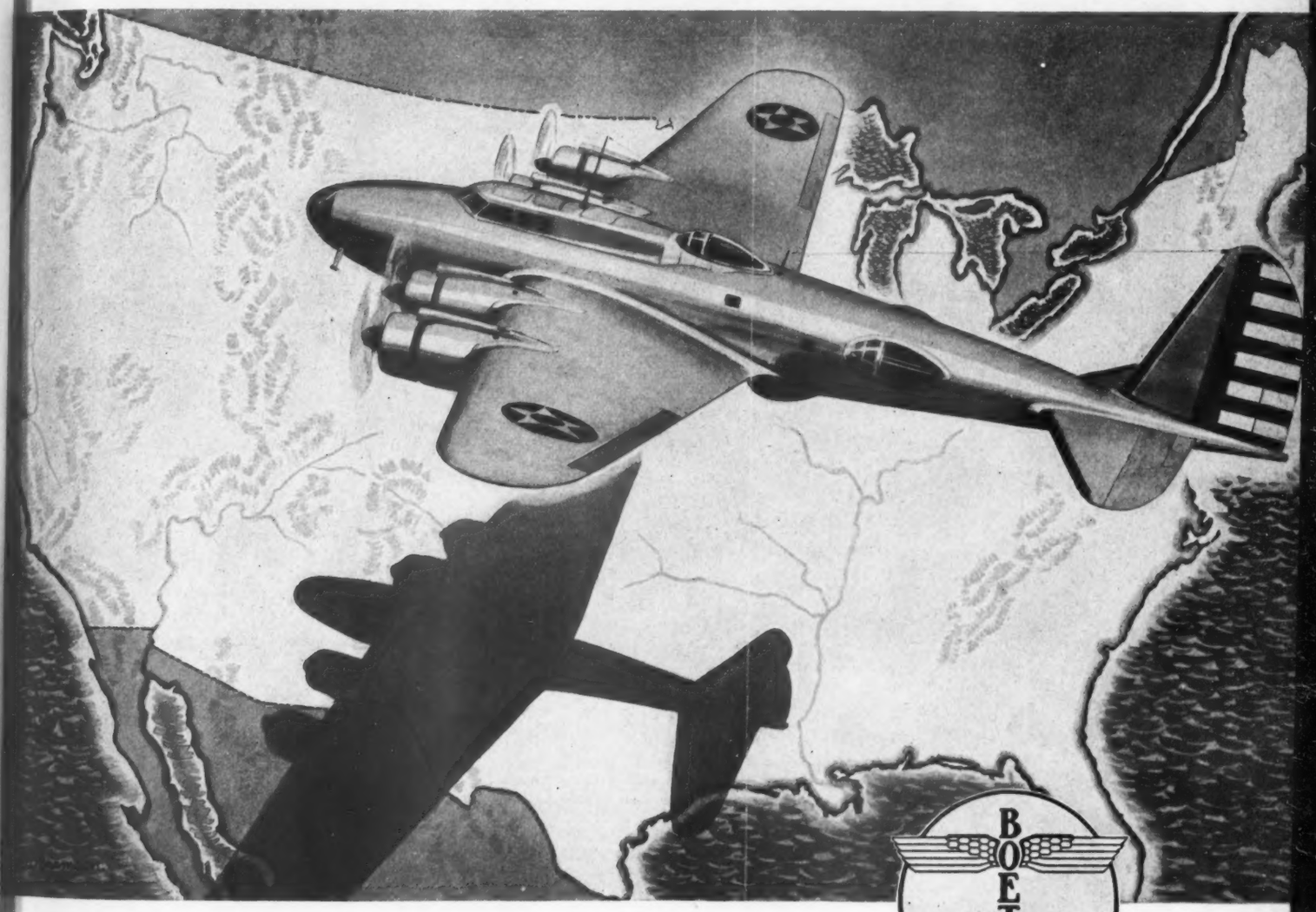
No. 2 of a series of photographs showing Aviation progress actually in the making. ALUMINUM COMPANY OF AMERICA, 2182 Gulf Bldg., Pittsburgh, Pennsylvania.

LOOK BEYOND HIM!

A lifetime spent by this die-maker winning his skill . . . years of painstaking research in developing an alloy with the best characteristics for the forging which the die will make . . . production facilities built with the one ideal of using in actual practice the best "know-how" contributed by engineering and research . . . such is the background of this picture. Men, materials, and machines are devoted unstintingly to making Alcoa Aluminum better for the jobs in which its lightness, strength, heat conductivity, and resistance to corrosion are needed. As the work progresses, it makes possible better planes, better performance.
(Photo of die-maker finishing Aviation forging die in Aluminum Company of America shops.)

ALCOA ALUMINUM

DEFENSE... *in step with the progress of a Nation!*



Built by Boeing for the United States Army Air Corps, this giant four-engined bomber and her 12 sister ships are bringing to the world a new concept in aerial defense. Too, these stalwarts portend the brilliant future of commercial air transportation as have other Boeing Bombers of the past. ☆ Thus through its farsighted policy, the United States Army not only provides continued assurance of national security, but once again quietly performs one of its characteristic services to civil progress by introducing the trend of tomorrow's air transports.

Boeing has always built tomorrow's airplanes today!

Eighty-four of these SBU-1 Scout-Bombers have gone into service with the U. S. Fleet during the past few months. Outstanding in performance and tactical effectiveness, they are already adding new lustre to this famous name—

Vought Corsair

CHANCE VOUGHT AIRCRAFT
East Hartford, Connecticut
Division of
UNITED AIRCRAFT CORPORATION

* *An additional production order for airplanes of the same basic type has just been placed by the U. S. Navy.*

THE
OLDEST AMERICAN
AERONAUTICAL MAGAZINE

AVIATION

Established 1916 . . .
McGraw-Hill Publishing Company, Inc.

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Leslie E. Neville
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Pacific Coast

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Washington

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For Mollison's "Flash"

THIS AND OTHER BELLANCAS ARE RIGGED WITH...

Captain James Mollison in his twin Wasp Jr.-powered Bellanca monoplane "Flash"

ROEBLING AIRCRAFT CORD

WITH controls operated by Roebling Aircraft Cord, Capt. James Mollison, in his Bellanca Flash, flys to a new record eastern crossing of the Atlantic.

Here, as on their other ships, Bellanca has standardized on Roebling . . . not only Aircraft Cord but Electrical Wire and Cable as well.

You will also find Roebling Aircraft Products widely used by most of the other principal plane builders.

Roebling Wire Aircraft Products include:— *Tinned Aircraft Wire; 19-wire Aircraft Strand, Tinned or Galvanized; Aircraft Cord (6 x 7, 7 x 7, 7 x 19), Tinned and Galvanized; Ferrules and Thimbles; Serving and Locking Wires; Control Strand and Casing; Power and Lighting Cables; Welding Wire.*

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TRENTON, N. J. *Branches in Principal Cities*

ONLY A FINE PRODUCT MAY JAR **BEAR THE NAME ROEBLING**

Flashes

From the Skyways of the World

» UNITED AIR LINES has just placed an order for some 13,000,000 gallons of gasoline with Standard of Indiana, delivery beginning Jan. 1. Some of the boys got out their slide rules, had a little fun. They figured that 13 million gallons would take the average automobile 6,280 times around the earth at the equator, would fuel it for 653 trips to the moon (if anybody wanted to go there). Through the average kitchen faucet running full out, it would take ten years to pour it all down the sink (provided no one happened to light the range).

» AIR SHOPPING is the latest. A wire, a phone call or an air mail letter to Air Shopping (304 East 41st Street, New York) will get you anything from beach clothes, baggage and brandy to Texas parrots and baby turtles. Rules are simple: cash on the barrel-head,—and the shipment is rushed to you by air express. Good idea, say we.

» HAD A PHONE CALL from NAA's Bill Enyart from Washington the other day to tell us that he was on the point of sailing for France to attend the annual meeting of the FAI at Paris. He is planning to take a short cruise into England, Germany and Italy before returning. With our own overseas experiences still fresh in mind, we are certain that Bill is finding his visit well worth while.

» AND SPEAKING OF RETURNED TRAVELERS, we see that Al Williams has been running a daily feature on his European observations in the Scripps-Howard sheets, including New York's *World-Telegram.*

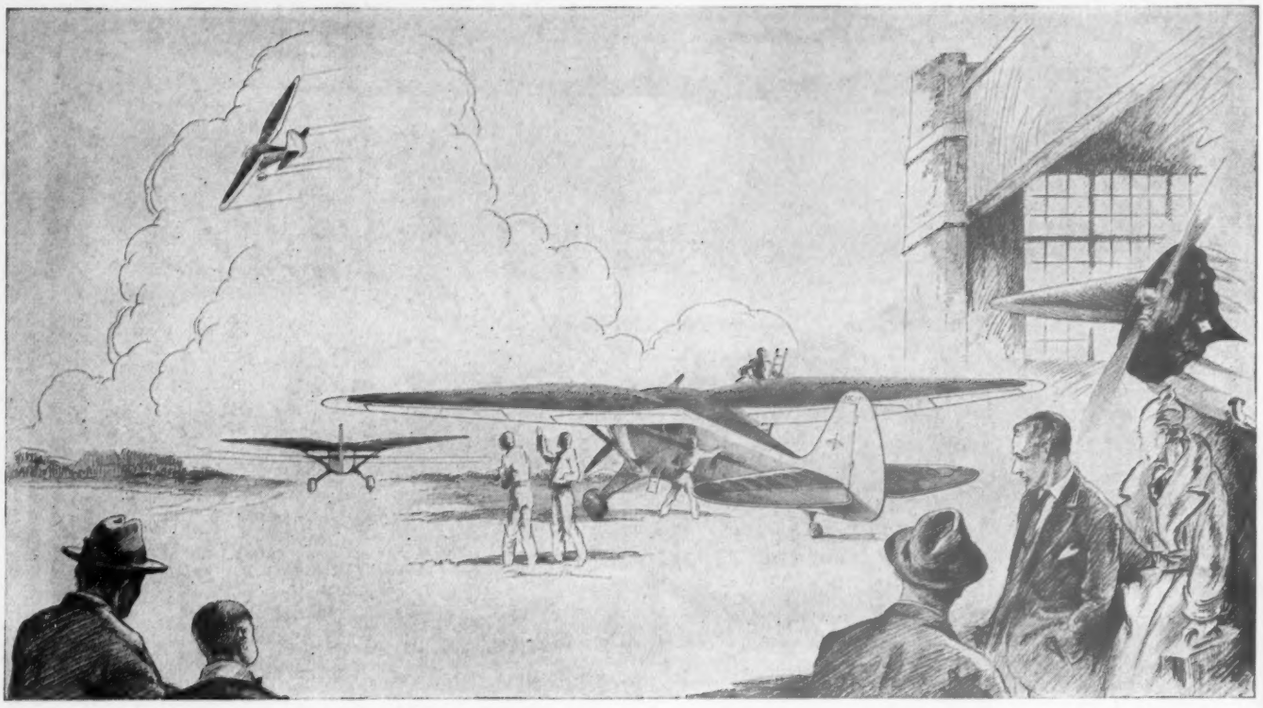
» AL MADE THE PAPERS, too, on New Year's Day when, for the second time (he did the same thing last year), he was the first man on the North American continent to greet the dawn of the new year. Taking off from Floyd Bennett Airport before sun-up in his brand new single seater, Gulfhawk II (built for him by Grumman and powered with a suped-up Wright G Cyclone—see also page 44), he pulled up to some 22,000-odd feet and watched the sun break over the eastern horizon long before it was visible to groundlings making whoopee in Manhattan far below.

» IN GETTING TOGETHER SOME MATERIAL for a talk on the electrical gadgets involved in this aviation business (for the Transportation Division of the AIEE) we ran across an interesting statistic. It takes some 1,200 ft. of wire to connect up the electrical circuits of a Martin Bomber, some 5,300 ft. for a Douglas DC-3. Quite a contrast to the "complicated" wiring of the good old JN4s over which we used to sit up nights as Air Service Kaydets during the w.k. Ruckus of 1918.

» FAVORITE TRICK of suburban hostesses is the progressive dinner, —cocktails at the Smiths', soup at the Doakes', entree at the Zilches', and so on far into the night. Same stunt was tried recently in Philadelphia, except that the guests progressed by air. Menu included cocktails at Patco, fruit cup at Wings, soup at Pitcairn, turkey (with trimmings) at Central, salad at North East, pie and ice cream at Comer-

AVIATION'S AUTHORS

We have with us this month . . . Daniel Sayre who is well known as a frequent contributor and former member of Aviation's staff. Dan has made a study of the recent changes in British air transport policy and records them here. . . . Charles Ogden Voight has dug up a lot of material around the San Francisco area. . . . W. C. Rockefeller, of Cal. Tech. and Dr. Norton B. Moore, of Douglas continue their consideration of the ultimate performance of airplanes. . . . Dan Brimm is with us again . . . and Ed Warner gives us the condensed version of the first real story of bumps and their effect on the airplane structure reported by Richard Rhode of the N.A.C.A., Langley Field, Va.



Away — TO A FLYING START..

Never satisfied to "let well enough alone" and dedicated to the traditional Stinson Policy of constant improvement without basic, obsoleting changes, the 1937 Stinson "Reliants" began coming off the Production Lines during the first week of January.

Champion of 1936, the "Reliant" is destined to lead again in 1937 because it embodies qualities that Owners and Users asked us to supply.

Admitting that the "Reliant" had the best combination of desirable flying essentials ever built into an airplane of its type, loyal Stinson Owners, who comprise the largest group of cabin plane Flyers in the Nation, urged us to go forward . . . to get more speed . . . even slower landing ability . . . better ventilation . . . a quieter cabin . . . better vision . . . additional comfort . . . improved accessibility.

Our Engineers have accomplished ALL of these improvements and added a few more for good measure. Months of designing, building, testing—then rebuilding and retesting until our Test Pilots said "OK For Production." Then weeks of retooling our Factory to produce this airplane in the largest quantity we have ever attempted and to the rigid Standards of Quality demanded by an Inspection Division which is a law unto itself because it has no Boss.

Many of our Distributors already have this 1937 "Reliant" for you to inspect and fly—more will be supplied to them as rapidly as Quality Production permits.

If you did not receive your copy of the 1937 Stinson Plane News, please ask for it. It is free and tells all about this 1937 Stinson "Reliant."

STINSON AIRCRAFT CORPORATION

DIVISION AVIATION MANUFACTURING CORPORATION

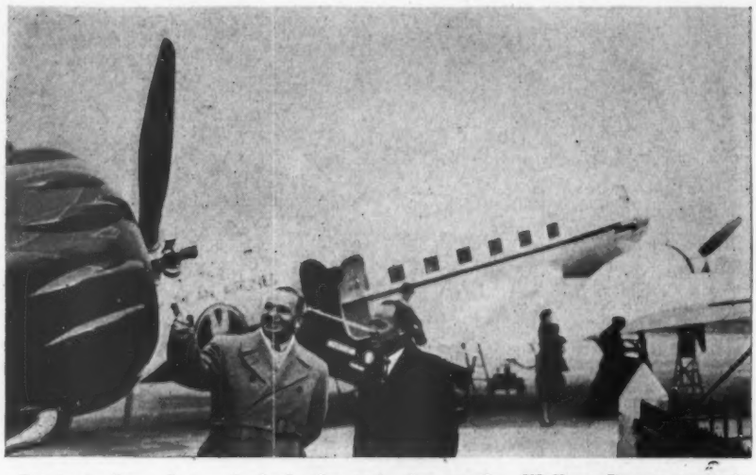
WAYNE MICHIGAN U. S. A.

ton, and coffee at Boulevard Airport. Forty eight planes went the rounds with 100 people on board. Although a 30 mile wind made the going anything but smooth, no casualties—gastronomical or otherwise were reported.

» ONE OF THE MOST INTERESTING and worth-while things we have seen for a long while is the demonstration called "Flight in Nature and Human Flight" put on at Philadelphia's Franklin Institute. Although keyed to the level of understanding of the average layman, we can guarantee that even the most hardened aerodynamicist will sit through the entire 35 minutes without a yawn. Beginning with a few very simple laboratory type experiments to illustrate the several possible forms of flight, the show moves along to a climax of model flights and motion pictures that are really remarkable. The pictures in particular should not be missed. They were taken with the ultra-high speed equipment at M.I.T. (1,200 frames a second) and show the intimate details of take-off and landing of a number of land and marine birds. They even slow down the wing action of a Humming Bird enough to permit a study of the behavior of the feathers in hovering and backward flight.

The demonstration is ably handled by Ralph McClarren of the Institute Staff, and secretary of the Pennsylvania Aero Club. It attracted many people during the recent holidays, and we understand that plans are afoot to take it on the road. We hope so, for the more people who can see it, the better.

» AVIATION'S DEMON DRIVER and Intrepid News Gatherer, Charlie Cleveland, is just in from a quick trip to the Pacific Coast where he found the aeronautical industry fairly reeking with good cheer and optimism for the prospects for 1937. Plants and people are busier than ever before; order backlogs, both commercial and military, have reached new highs. Charlie drove out, flew back via TWA. Westbound, he covered the 3,500 miles in nine days and, in spite of several mechanical failures, a brush with the Law, and a blizzard over the Alleghenies, reports that he still likes to drive. On the way he looked in on Fred Parks at E. St. Louis, Claude Ryan and Earl Prudden, Ed Gott at San Diego. In L.A. he went through Douglas, North American, Northrop and Lockheed, visited around Grand Central and United Terminal. Eastbound, he looked over TWA facilities at Kansas City and Chicago.



Astute traders always look the horse in the mouth. Wallace Beery seems to have the same idea in discussing a swap with Stinson's Jack Kelly.

» NOT LONG SINCE we spent a very interesting hour in the air with "Van" VanCleve, right hand man to Dave Little of RCA's aircraft radio department. (Dave was down with the Grippe at the time, but we are glad to know that he is back on his feet. We say it feelingly, for the entire staff of AVIATION has just pulled through it, and we know it isn't much fun.) We had dropped in at the Camden shop to get caught up on the latest in RCA equipment, and, after going through the new demonstration room (which, incidentally, is a very swell set-up; well worth a look if you are near Philadelphia) we wheeled out the Fairchild 24 and cruised up and down the river for a while giving the new radio compass a work-out. It was a pretty foul day, as days go. Ceiling and visibility were adequate, but we barged through occasional rain and snow squalls that unloaded plenty of static. It made a good demonstration, however, for, in spite of the interference, we were able to get bearings on plenty of stations to keep ourselves located all the time.

RCA has assembled quite a fleet of aircraft for their radio research. In addition to the original Stinson R which is still in service, they now have the Fairchild 24, a Waco C and a Ford tri-motor purchased from TWA. The ships operate all over the country, but Camden is their home port. Hal Emrich, operator of the Emrich Flying Service, keeps them in shape.

» MANY A MOVING PICTURE STAR swanks through the "close-up" in helmet and goggles, lets a double do it when it comes to the actual flying. Not so Wallace Beery. A two-fisted sportsman, he is equally at home with rod and gun, on horseback and on wheels,—and on wings in the air. He has been a transport pilot since 1928, has owned a number of planes, uses them to travel to the out-of-the-way places where the hunting and fishing are good. Latest addition to his aerial stable is one of the new 5-place Stinson Reliants (page 35). Not long since he travelled up to Wayne to take delivery of the new ship and to look over the Stinson factory.

BENDIX

AIRPLANE WHEELS · BRAKES · PILOT SEATS AND PNEUDRAULIC SHOCK STRUTS

AIRPLANE PRODUCTS:

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High and Low Pressure "Streamline" Smooth Contour

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TAIL WHEELS
Low Pressure "Streamline"

★

AXLES
For All Wheels

★

BRAKES
Mechanically and Hydraulically Operated

★

OPERATING CYLINDERS FOR HYDRAULIC BRAKES

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TAIL WHEEL KNUCKLES
For "Streamline" Wheels, Steerable and Swivelable with Shimmy Dampener

★

PNEUDRAULIC SHOCK STRUTS
Designed and Tested to Meet Individual Requirements

★

PILOT SEATS
Standard Army and Navy Type

ENGINEERING INFORMATION IS AVAILABLE TO THOSE INTERESTED

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NATIONAL AIR SHOW
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AIRPLANE WHEEL AND BRAKE DIVISION • SOUTH BEND, INDIANA
(Subsidiary of Bendix Aviation Corporation)

Side Slips

By ROBERT OSBORN

» UNLESS THE AIRPLANES ARE ABLE TO DO SOMETHING to counteract the publicity from the movies and the newspapers, air transport passengers are going to get the impression that they are riding in the modern equivalent of the stage coach in the wild and woolly days of the west. In two recent movies, "Thirteen Hours By Air" and "Fugitive in the Sky" a gunman passenger stabs a

few people and shoots up the plane as if it were the Last Chance Saloon. The newspapers always give Mr. J. Edgar Hoover and his "G" men lots of space whenever they are hauling their captured gangsters off to the lockup by airplane, and all murderers who escape from jail or from the sheriff are immediately reported to have made their getaway by air.

If this sort of thing keeps up passengers are going to refuse to go out on a trip without Bat Masterman and Deadwood Dick as pilots, Annie Oakley as stewardess and with Wyatt Earp "riding shotgun" on the Wells Fargo express box.

» THE PAPERS REPORT that air line traffic was so heavy around the holidays that executives of the companies had to do their traveling on the railroads. If they were recognized by the railroad officials we'll bet they couldn't get any accommodations but the upper berth at the end of the car farthest from the lavatory, right over the wheels,—and on the slowest train.

» TO CELEBRATE the occasion of dedicating the new airport at West Palm Beach, Florida, the mayor and postmaster of that town sent two baby alligators by air mail to Postmaster General Farley and to Mayor F. H. LaGuardia of New York.

We suppose that Mr. Farley would not need to worry about mail of this type from any points in the solid south, but he probably doesn't open any "animal" mail bearing Maine or Vermont post-marks.

» AVIATION SEEMS TO BE getting quite a play from the tobacco companies lately. In recent advertisements "America's Number One Test Pilot" and the Lady Glider Champion have been maintaining their digestions with the aid of Camel cigarettes, in spite of their aeronautical activities. Now Chesterfield features a half page advertisement of the Pan American China Clipper arriving at Wake Island and telling of the two radiograms "Rush ten thousand Chesterfields today's China Clipper" and "Chesterfields just arrived. Fast work. Panair Wake."

Knowing a bit about the shortcomings of human beings we are wondering if that radio message didn't also have a sentence which was not printed,—"Why the devil didn't somebody think to send us at least one box of matches too?"

» ISN'T IT TO BAD that we will have trouble with Brazil in spite of President Roosevelt's "Good Neighbor" trip to South America? Of course there aren't any signs of trouble just yet, but there is certain to be some soon,—a pilot recently completed a "Good Will" flight from the United States to Brazil.

» WE SEE THAT THE AUSTRALIAN AUTHORITIES have suspended the flying license of a doctor who is reported to have been given the title "Reckless Angel" by the aborigines of the Australian bush. As this title is a bit difficult to understand we think someone must have translated the native dialect incorrctly. They probably call him "Reckless and likely to become an Angel."

» SIR HUBERT WILKINS, who gave up the airplane in favor of the submarine as a means of travel for exploration, is now in England trying to obtain the remaining financial assistance necessary for his proposed trip under the Artic ice. His submarine will be able to remain submerged for five days, additional air supplies to be obtained by means of holes drilled through the ice to the surface. He plans to leave Spitzbergen in July to cross the North Pole under the ice to the Bering Sea.

Of course Sir Hubert hasn't asked us to go along but in case he was planning to do so we regret to announce that we have a very pressing engagement in July. We have to see a fellow about a couple of dogs.

CONSTANT supervision of every mechanical detail is the most important element in airline operation. Here a PAA mechanic gives final touches to the engines of a Clipper before departure for the long haul to BA

CARNIVAL in MANHATTAN

First Airshow in Seven Years taps a reviving Eastern Market

STRANGE THINGS BEGAN to happen around Manhattan about a week ago. Patrolman Patrick O'Sullivan, on traffic duty for 20 years at 46th Street and Lexington Avenue, told a weird tale at dinner one night.

"Begorrah it almost hit me, that divil's contraption of an airplane without wings that drives up the street like a taxicab. I was going to give it a ticket but the driver was a good guy named Jim Ray and I let him go with a warning."

Several Days later Patrolman O'Sullivan had another near-heart attack when Casey Jones blackened the sky with a formation of miscellaneous commercial airplanes. The same night all seven little O'Sullivans nearly fell out of bed when the Army and Navy began to dive on the city in a simulated air attack.

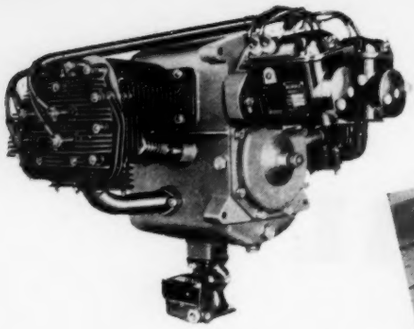
As you may have guessed by this time, the strange happenings that plagued the O'Sullivans were just the brain children of Manager Parsons and Publicity Director Moore of the National Aviation Show.

Within the Grand Central Palace during the period of Jan. 28-Feb. 6 will be a number of educational exhibits. A miniature version of the Newark airport control tower with an opportunity for the public to listen in on operations . . . a demonstration of the one-pound balloon-borne radio meterograph which investigates and reports on weather conditions at ten minute intervals in its 10-mile high flight . . . a giant map of the United States made particularly for pilots by the Coast and Geodetic Survey . . . models of some of the NACA laboratory equipment . . . a Post Office Department exhibit of the history and present status of the air mail system . . . Army, Navy, and Coast Guard equipment . . . activities of the N. Y. National Guard . . . activities of women in aviation . . . model building by the Junior Birdmen . . . and an old-timers' booth by the Early Birds.

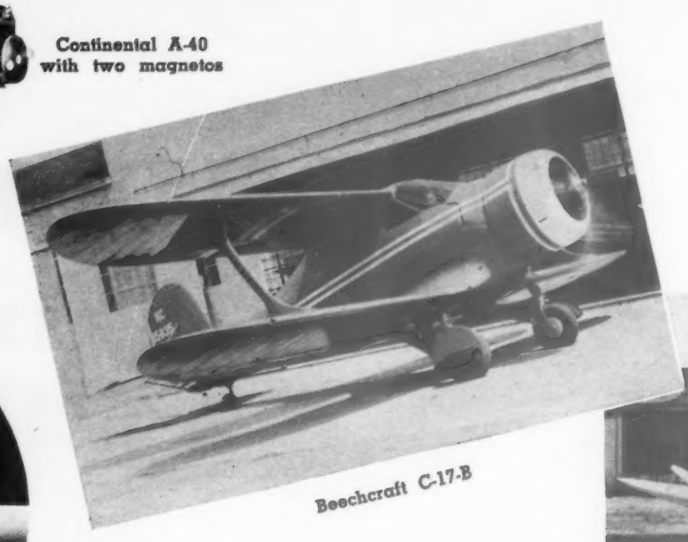
Included in the air transport exhibits will be the TWA "Overweather laboratory" with personal appearances of D. W. (Tommy) Tomlinson.

Advance predictions of show exhibits are always dangerous, but the following constitute the best intentions of certain exhibitors at the time of writing:

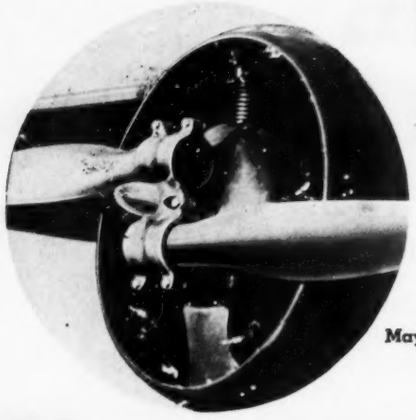
(*Turn to page 22*)



Continental A-40
with two magnetos



Beechcraft C-17-B



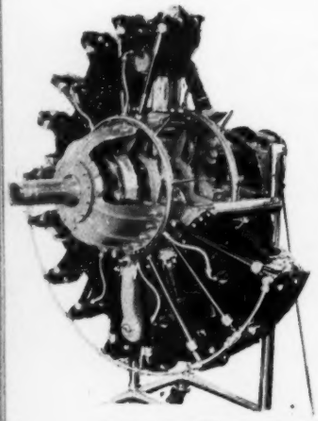
Maynard-Di Cesare
propeller

Twin engined
Lambert Monocoach

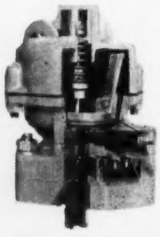
Lycoming R-680-B

LIST OF EXHIBITORS NATIONAL AVIATION SHOW

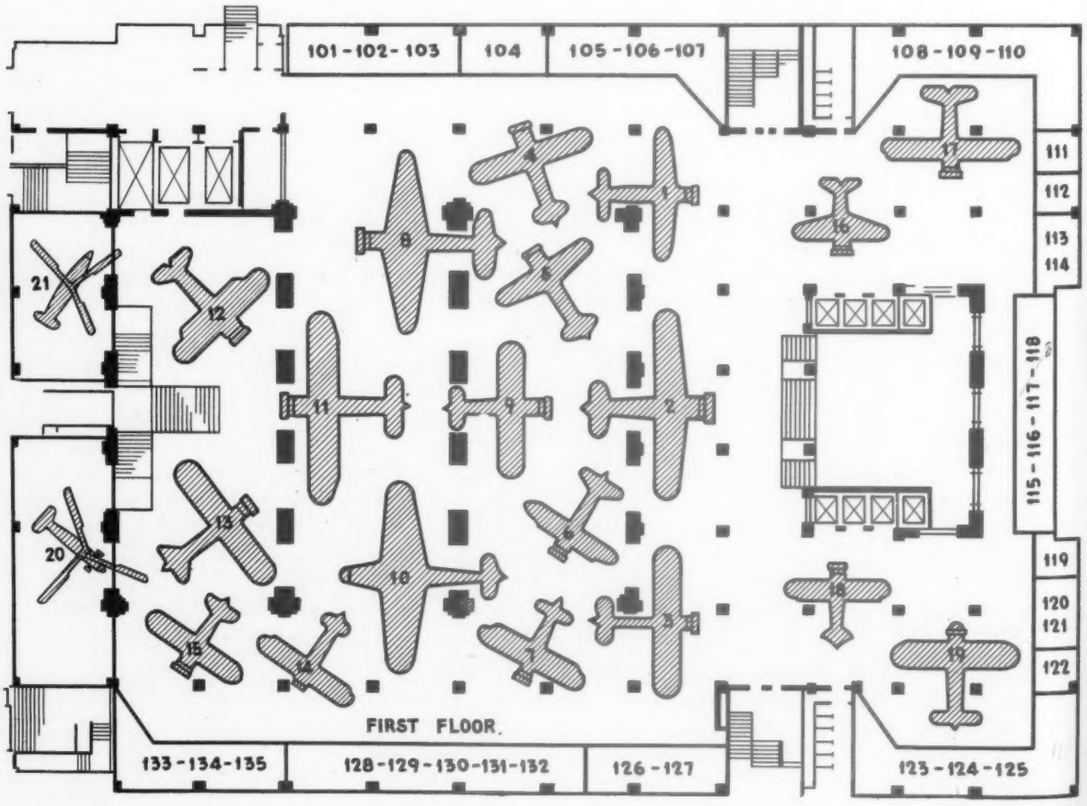
Aero Digest	212
Aeronautical Corp. of America	8, Mezz.
Ailor Sales Corp.	214
American-LaFrance & Faomite Industries, Inc.	344
Argonaut Aircraft Co. Inc.	15, Main
Arrow Snort	211–6, Mezz.
AVIATION	254
Aviation Mfg. Corp., Lycoming Div.	126–7
Barkely-Grow Corp.	249
Barr Shipping Corp.	218-B
The Beech Aircraft Co.	11
Bendix Aviation Corp.	128—132
Berry Brothers Inc,	210
Boeing Aircraft Co.	113–4
Breeze Corp.	251–2
Braman-Johnson Flying Service, Inc.	255
B. G. Corp.	235
Cessna Aircraft Co.	17
L. C. Chase & Co., Inc.	342
Cities Service, Corp.	237
Clersite Products	257
Cleveland Pneumatic Tool Co.	244–5–6
Continental Motors Corp.	233
Cuno Engineering Corp.	384
Edo Aircraft Corp.	120–121
Encyclopedia Britannica	238
Fairchild Aircraft Corp.	19
Federal Laboratories, Inc.	207
Fleetwings, Inc.	8
Jacobs Aircraft Engines	104
Johnson & Faulkner	408
J. V. W. Corp. & Radio Aircraft & Instrument Co.	215
Albert B. Hoffman	360-A
Horace Keene Aircraft Corp.	4, Mezz.
F. W. Kessler	219–20
Walter Kidde & Co. Inc.	226
Kollsman Instrument Co.	234
The Lional Corp.	402
Luscombe Airplane Development Corp.	14
Maynard DiCesare Propeller Corp.	206
Moncoupe Corp., Lambert Field	6
Oldham "Multi" Tool Co.	350
Parks Air College	218-A
S. S. Pike Co. Inc.	229
Zolan H. Polachek	389
Popular Aviation	223
Porterfield Aircraft Corp.	2 & 3
Pyrene Mfg. Co.	381
R. C. A. Mfg. Co., Inc.	215
Radio Navigational Instrument Co.	246
Rearwin Airplanes Inc.	9, Mezz.
Roosevelt Field, Inc.	225
Ryan Aeronautical Corp.	10
Safair Inc.	210
Selley Mfg. Co., Inc.	330

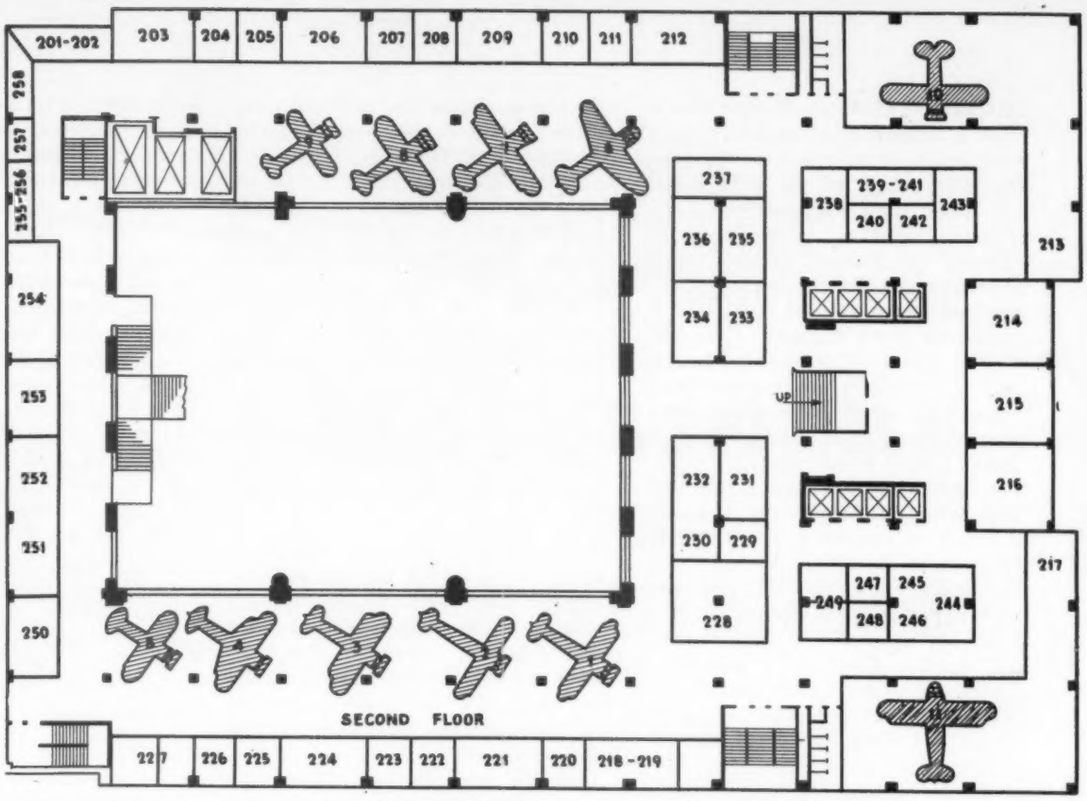


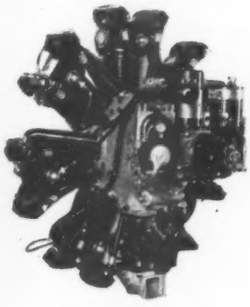
Cutaway Wasp H



Constant speed
control unit

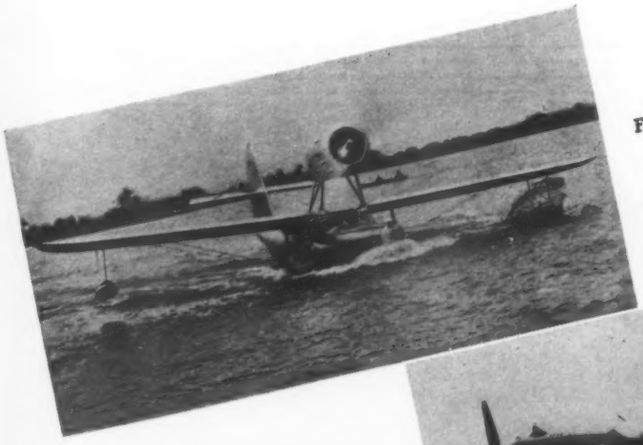






Warner Super Scarab

Sensenich Bros.	387
Seversky Aircraft Corp.	Spec. 12-A Main 12 Main
Sinclair Refining Co.	253
Snap-On Tools Inc.	240
Sperry Gyroscope Co., Inc.	232
Standard Flying Service Inc.	5 Mezz.
Stewart Technical School	221-A
Stinson Aircraft Corp.	3–7
Street & Smith Publications	400
Switlik Parachute & Equipment Co.	376
Taylor Aircraft Co.	1 Mezz.
Teicher Mfg. Co.	387
Transcontinental & Western Air, Inc.	101–2–3
Richard Rosebury Organization, Inc	385
Trips	317
United Aircraft Corp.	105–6–7
United American Bosch Corp.	242
Virginia Rubatex Corp.	359
Waco Aircraft Co.	1 & 4
Warner Aircraft Corp.	112
Wellington Sears Co.	348
Western Flying, Occidental Publishing Co.	245
Wright Aeronautical Corp	133–4–5
Bellanca Aircraft Corp.	9-Main
Shell Union Oil Corp.	228
Bowey's Inc.	343
Aeronautical Chamber of Commerce of America, Inc.	
AirReserve Association of the U. S.	
Aviators Post No. 743, The American Legion	
Boys Clubs of America	
Contact	
Early Birds Association	
Junior Birdmen of America	
National Advisory Committee for Aeronautics	
National Aeronautical Association	
New York Board of Education	
New York Daily Mirror	
Newark Airport	
National Association of State Aviation Executives	
Private Fliers' Association	
Soaring Society of America	
State Aviation Associations of New York and New Jersey	
U. S. Army	
U. S. Navy	
U. S. Works Progress	
U. S. Coast Guard	
U. S. Bureau of Air Commerce	
U. S. Geodetic Surveys	
U. S. Post Office	
Women in Aviation	
27th Division Aviation, New York National Guard	
New York University	
New York Evening Journal	
Sportsman Pilot Association	

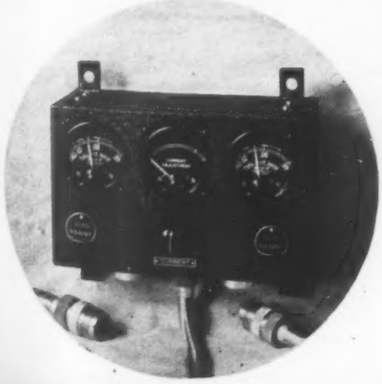


Fleetwings Seabird

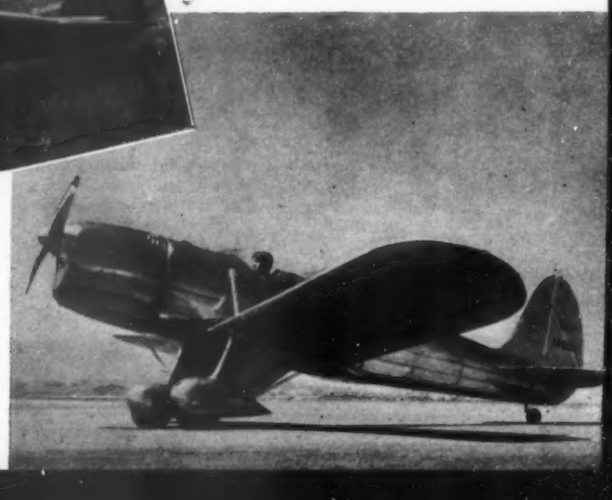
Kollsman Sensitive Altimeter

Ford V-8 powered Arrow monoplane

Menasco powered Ryan S-T



Breeze Exhaust Gas Analyzer



AIRPLANES: Oldtimer Horace Keane with a modern Ford engined "Ace" very much of an improvement over the 1920 design of the same name . . . latest high and low wing designs by Aeronca . . . the Argonaut "Pirate," a Menasco powered amphibian in the $5,000 price class . . . the new Arrow sport V-8 with a converted Ford engine . . . a B17 B and Louise Thaden's Beechcraft and a collection of trophies and plaques . . . the shotwelded stainless steel amphibian "Sea Bird" now in production by Fleetwings, Inc. . . . the low wing Monocoach and the high wing Monocoupe by Lambert Aircraft Corporation . . . LeBlond 90 powered Rearwin Sportster (See AVIATION, January, 1937) and the higher performance Speedster . . . a 125 hp. Ryan S-T-A similar to the one in the Chesterfield advertisements . . . the larger and faster Stinson Reliant for 1937 (see page 35) . . . seaplane float equipment installed on a Taylor Silver Cub . . . attractive models of the Vought Scout-Bomber, and Fighter, and the Sikorsky S-42 and S-43, by United Aircraft Corporation . . . a new Waco line for 1937 with a host of detailed improvements.

ENGINES: Model R-680-B, 260 hp. Lycoming engine and two and three bladed controllable propellers by Aviation Manufacturing Corporation . . . two W-670 (radial) and two A 40 (opposed) Continental engines, including the new Series 5 A 40 with double ignition . . . a 1937 Jacobs L-5 285 hp. engine with specific weight of 1.66 lb. per horespower . . . animated cutaways of four Pratt & Whitney engines (including a Twin Wasp) and automatic mixture control, two controllable pitch propellers and a cutaway constant speed control mechanism . . . the latest Warner Super Scarab (145 hp.).

ACCESSORIES: The new Alfite Aircraft System of fire extinguisher for aircraft and airport fire fighting equipment by American-La France and Foamite Industries, Inc. . . . what the well dressed aviator should wear while on duty in the opinion of S. Appel & Co. . . . a new exhaust gas analyzer, fuel and oil tanks, shielding material, shafting, and tubing made by Breeze Corporations, Inc. . . . the Cuno Engineering Corporation's new automatic, self-cleaning oil filter for aircraft engines . . . standard float equipment and the new amphibians float gear (see page 37) developed by Edo Aircraft Corporation. . . . the Sensitive Altimeter, and other Kollsman products including electric and magnetic tachometers, electrically heated Pitot static tubes and "Telegon,"—a remote indicating device . . . Maynard-Di Cesare will show automatic, constant speed, adjustable pitch, and turbine type propellers having offset blades of arc section. . . . Pyrene's new Phomaire Play Pipe for airports, a new 2-quart hand extinguisher and other fire apparatus. . . . a new spark plug, battery ignition, switches, and magnetos by Scintilla . . . a replica of an Eastern Airlines transport cockpit with instruments and radio earphones for visitors to listen in on actual orders, and a large scale model of an American Airlines' "Flagship" furnished by Sinclair Refining Co. . . . a new rubber product, "Rubatex" made by Virginia Rubatex Corporation.

SCHOOLS and SERVICES: Displays depicting the sales, instruction and aerial photography work of Braman-Johnson, Inc. . . . advice to young men wanting to get into aviation by Parks Air College, Inc. . . . emphasis on a new Airline Operations course by the well known Stewart School.

★ ★ ★

It's a long way from the ground to the nose of this United Mainliner built by Douglas.

More quiet than a Pullman car is the interior of the Skylounge with seats for fourteen passengers. Views fore and aft.

MAINLINERS for HEADLINERS

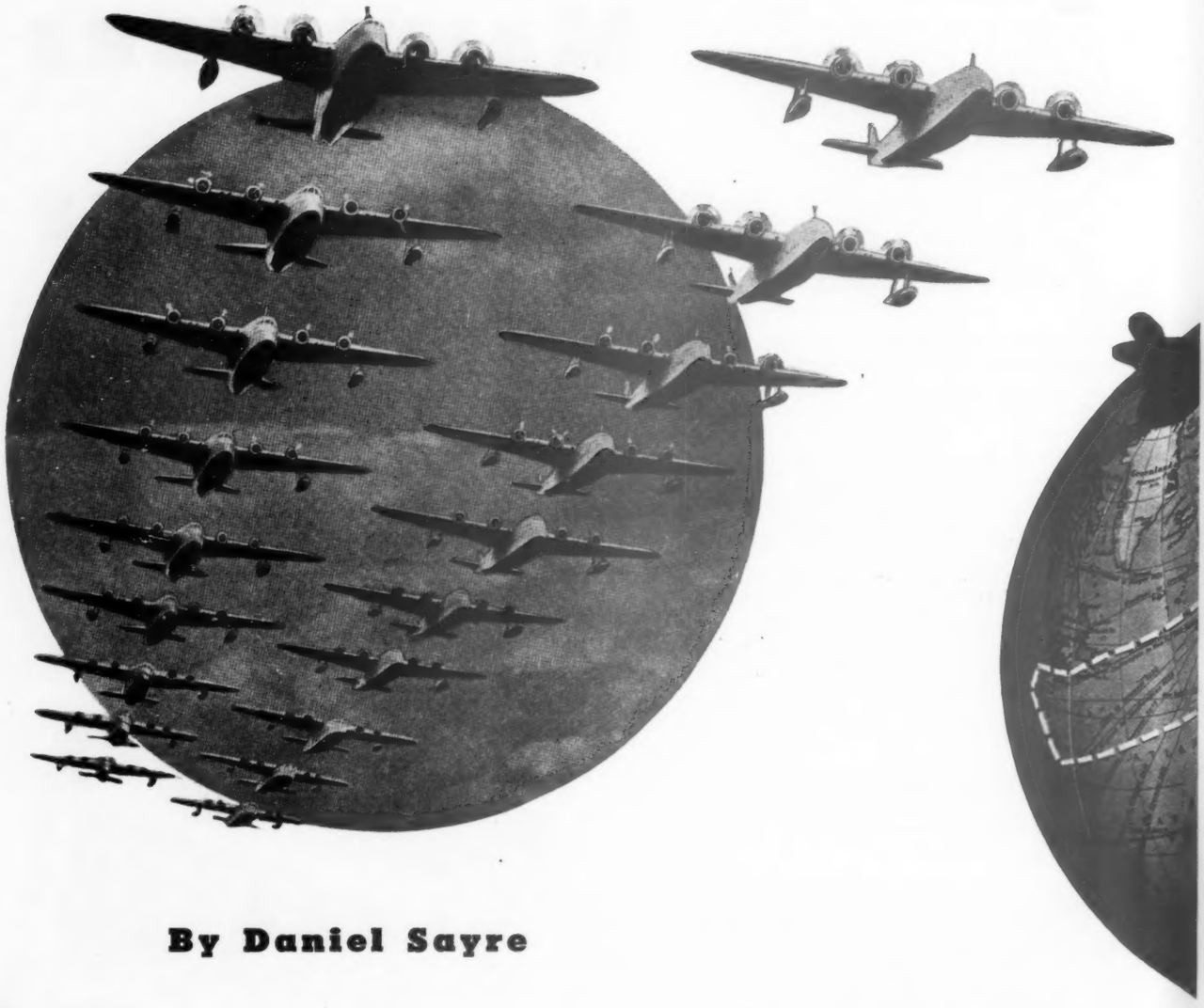
LUXURIOUS New York-Chicago non-stop service was started Jan. 19 by United Air Lines, using 14-passenger Douglas DC-3s, which United has named "Skylounges." They have normal capacity for 21 passengers, but United has installed only 14 completely swiveling chair seats.

Fares on the Skylounge service are $2.05 higher than standard fares, the New York-Chicago fare being $50, instead of $47.95.

At the start one round trip a day was run, but that was scheduled for expansion with delivery of additional ships. The 14-passenger version, of which ten have been ordered, will eventually go into coast-to-coast service. By May 15 plans call for establishment of sleeper service, evening services originating in Skylounges and connecting with already-made-up 14-passenger sleepers at Chicago and Salt Lake. Night schedules will originate as sleepers. Eight sleepers have been ordered from Douglas, and following them will come five more 21-passenger versions of the DC-3, which will be used for local, heavy-traffic runs.

Hot food from the galley (above) is served on individual tables (top).

BRITAIN BIDS— for New Airways



By Daniel Sayre

FOR SOME TEN YEARS the American air transport industry has looked upon its British counterpart as something fine and conscientious, probably as comfortable as the British aviation magazines say it is, but no more susceptible to revolutions of policy than the basic design of Queen Mary's hats.

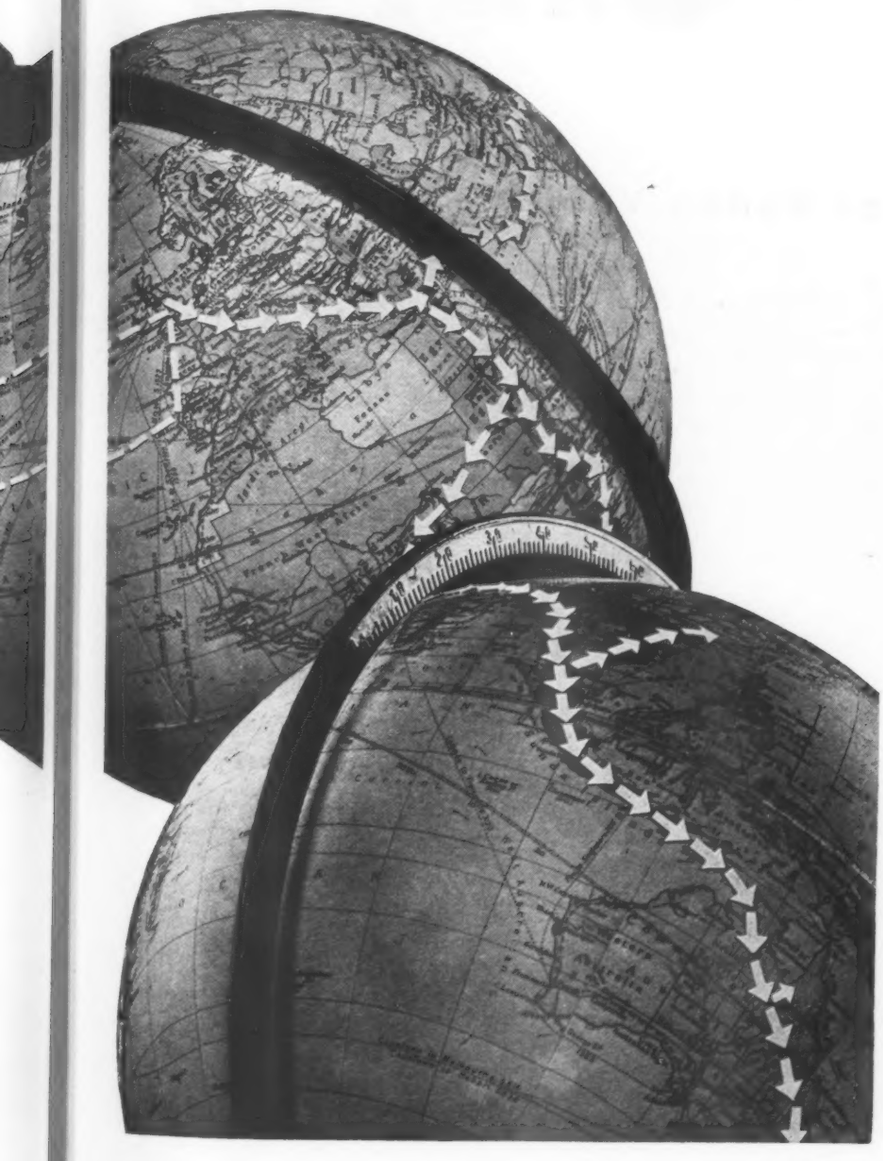
Recently, however, things have been stirring, but probably not quite as suddenly as it looks from over here. For years there has been talk about "an Empire Air Mail Plan." For years, too, we have heard about what Great Britain would do in the Atlantic once she got around to it. And ever since the McRobertson race there have been rumors that Imperial Airways planes weren't always going to lumber along on 110 mile an hour schedules. We even received definite word that a new equipment program had gotten underway sometime late in 1935.

Somehow, though, none of us ever felt that all these things would ever come true at the one and the same time. In all of its honorable history, Imperial Airways had never given any one cause to suspect it capable of breaking out in a perfect rampage of progress. Yet that's just what it seems to be doing: 18-ton high-speed flying boats slipping off the assembly line like Taylor Cubs; four-engined super-speed land transports "almost ready for tests" months before our corresponding DC-4 project

to Conquer

even promises to be off the drafting table; real action toward a service across the Atlantic. New routes going in here, old ones to be torn up and moved there, schedules to be slashed, frequencies to double and redouble, night flying to start. Behind it all, a design to make the world's first real test of no-surcharge air transport of first class mail.

The more you sort it out, the more you realize that it all shapes up into a surprisingly unified and formidable plan. The more you study the plan, the more obvious becomes the promise to change the development of air transportation the world over. Call it long-nurtured strategy, or a triumph of "muddling through" as you prefer, Imperial Airways' program for the immediate future, if carried out as announced, can scarcely fail to give Great Britain a position in air transport equalling her leadership in ocean commerce. Herewith a summary of that program.



IT MUST first of all be appreciated that Imperial Airways is "the chosen instrument of His Majesty's government for the extension of Empire air routes." For a few years after Imperial was put together in 1924 from four competing trans-channel companies, it concerned itself chiefly with cooperative services between London and neighboring European capitals. (It still, of course, operates such services through its subsidiary, Imperial Airways Continental Ltd.). But for a decade its major concern has been the creation and operation of airlines linking portions of the British Empire to the mother country and with each other. Milestones: Cairo-Basra (1926), London-Cairo (1929), Basra-Karachi (1929), Cairo-Capetown (1932), Karachi-Singapore (1933), Singapore-Sidney (1934), Penang-Hongkong (1936), Khartoum-Kano, Nigeria (1936). Total present routes stand at slightly over 27,000 miles.

For this Imperial Airways has received a moderate direct annual sub-

(*Turn to page 69*)

How a fixed base operator and a college flying club got together

CUBS on the CAMPUS

By Charles Ogden Voight

JOE DONOVAN gazed wistfully out of his office window at the monotonus bayside flats of the Santa Clara Valley and reached for an aspirin. Here was the kind of flying country one would expect to find in Heaven, with a college full of young men at the very doorstep, and yet not enough business from the combination to keep even a single airplane busy for a day at a stretch.

There had been a method in its madness when Associated Air Services set up headquarters in a spot that was bounded on one side by the Stanford University Campus back in 1930. Surely some of the men at the college would be interested in flying, and if they were not, a sales drive would be put on that would get them to fly. All this had been done in days gone by but in this new era the books showed that the flying school had not been able to compete with new economy and students who now balanced their budget.

He inquired among his friends and associates. He discussed the problem with nearby operators. He put up the question to fixed base operators through the world through the Operators' Corner in AVIATION MAGAZINE. Still Donovan found no one else's answer fitted his problem.

Now the aspirin tablet Donovan had taken was not one of the quick acting variety about which we read so much in the advertisements. In fact it was very slow in getting started. It induced a sort of dream in which its subject found himself reflecting on his past life. His mind turned back to those carefree school days when he was like those boys in the nearby palace of learning. Suddenly it occurred to him that college men can't write home for parental checks each day or week. Even the most ingenious sometimes run out of ideas for "justifiable expenditures." Like an apparition rising from the blue waters on San Francisco bay, the answer appeared. Maybe the product was beyond the prospects' means. But how in the name of Heaven could he reduce the price. The profit margin was already dangerously narrow.

WITH or without benefit of aspirin, the collective thinking of a group of Stanford students was moving in the same direction. Finally they got their heads together with Donovan and things began to pop. They remembered the example set by Amherst College in 1935 and that new light planes could be bought for very little down and not much a week. Before many hours had passed each of twenty club members had bought six hours of flying time at four dollars an hour. The down payment on a ship had been raised!

But the club was not buying the plane. It was merely making a paying proposition to the airport operator. The club would pay the down payment and in return receive a guarantee from the operator of 120 hours time credited to the club.

This started the ball rolling. From then on it was easy. The air service agreed to furnish time at $4 an hour on ships purchased in this way. New members flocked to the club house. Now the club has its own official plane and the use of five others operated by Associated Air Services. One of these is equipped with floats.

The airplane finally decided upon was the Taylor Cub. Some members wanted a larger and faster ship but those desiring economy won the day. For those who want time on heavier equipment, two Fleet trainers owned by Associated Air Services are available at a slightly higher hourly rate. Three of the club members own their own ships.

Many of the twenty charter members did not know how to fly when the club was formed, but now all have at least soloed although the only prerequisite for membership was and still is an interest in aviation.

An annual fee of one dollar is charged to cover incidental club expenses and pay for prizes in the frequent competitions. Monthly contests are the spice of club activities. The club won the championship cup at the Intercollegiate Flying Meet sponsored by the N.A.A. at Detroit last June. And it plans to hold onto it. Every week finds members bomb dropping or spot landing or doing the other things necessary to win air meets.

ONE SUNDAY in each month is devoted to a small scale air meet. The flyer winning the most points for the series of meets held during the year gets a cup and is considered Stanford's No. 1 pilot. Spot landing and bomb dropping are the principal activities. For the latter paper bags filled with one pound of fine earth mixed with lime make very serviceable bombs.

Rules are as follows:

Two landings to be made by each contestant:

1. 1-360 degree turn and land to a spot.
2. After first landing, attendant will furnish you with two bombs.

They shall be dropped at an altitude of not less than 500 ft.

The best of the two will count on score.

After bombs are dropped contestant will then make a straight approach to land.

The gun must be cut at 500 ft. or higher.

Clearing motor after passing fence means disqualification.

Bad landing will mean disqualification. Slipping is permissible.

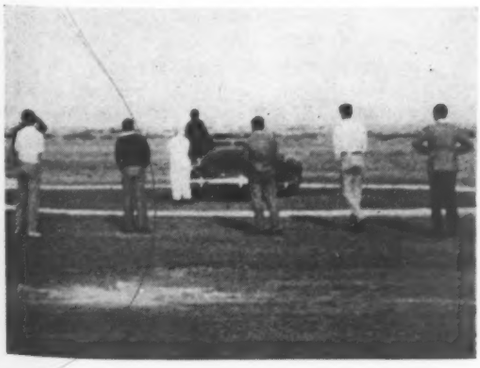
Measurement will be taken from where the tail skid touches to the line.

The line is to be considered a ditch and any landing on the south side (front) of the line would be a theoretical crackup—disqualification.

Short side trips that lead over the San Francisco bay, to the Golden Gate, down along the coast to Del Monte and other enticing resorts are the frequent destination of many an afternoon jaunt.

In the opinion of Walter Rosenfield, the Stanford Flying Club president, it is only a matter of time, especially at Stanford, when flying will become a regular extra-curricula activity, and meets will be held with local schools such as California, Southern California, and U.C.L.A., to be topped by the N.A.A. intercollegiate meet in the spring of each year.

One of the Associated Air Service Cubs



Left: Spectators believe the safest place is in the center of the target during bomb dropping contests. Above: Club members and their Cub

The second of three articles on

The Technique of Water Flying

SEAPLANE HANDLING

By D. J. Brimm Jr.

THERE ARE FOUR main types of "disembarking" points which the seaplane pilot is likely to encounter. These are the seaplane ramp, the float, the dock or pier, and the beach. Each of these calls for a different technique. In addition, it is sometimes, though not often, necessary to unload passengers into a boat.

Ramps, found only at seaplane bases of more or less pretentiousness, may be roughly divided into three classes: the stationary ramp, the turntable ramp, and the marine railway, which is not strictly a ramp but which calls for the same general type of approach and, hence, is considered with the first two.

The stationary ramp is simply an inclined platform leading from the land into the water and extending well below low water, where there is a tide or other variation of water level. If designed for seaplane use, it should be built of heavy planks laid *crosswise*, and with the nails or spikes set well below the level of the surface. A spike sticking up can raise merry havoc with the bottom of a float. If such a ramp is wet, any ordinary seaplane will slide up under its own power. The wetting is usually accomplished with a hose, though buckets may be used if a hose is not available. In many cases, if the ship has plenty of power, enough water will drip off the floats on the way up to lubricate the surface sufficiently. If the ramp is made of concrete, however, it should be touched as lightly as possible, or preferably not at all, until some sort of beaching gear has been attached, of which more anon. After the ship is out of the water on a wooden ramp, it is possible, by wetting the ramp thoroughly, to turn it around by having a mechanic hold one wing while the motor is opened up. This practice causes severe abuse to the floats, however, and is not recommended except in emergency. If attempted, boards should be placed under the floats at ninety degrees to the keel to eliminate the possibility of the keel dropping into a crack.

To start the ship moving on a ramp it is usually necessary to open the throttle nearly all the way and rock the ship back and forth with the elevators. The pilot must be alert, however, and close the throttle the *instant* the ship begins to move as otherwise too much speed will be attained in a hurry.

In the case of the turntable ramp, such as those installed at the two New York City Skyports, the ship should be gunned up until the rear of the floats is just clear of the water and held there at about one-quarter throttle with elevators down until a mechanic puts a block under the rear of the floats to keep the ship from tipping back, or, until the turntable is rotated ninety degrees. To get the ship off these ramps, the turntable is rotated through a total of 180 degrees, and the ship gunned off by opening the throttle gently. In leaving a ramp, the rudders should be kept up. If the angle is steep, it will be found that the stern of the floats will strike the ramp with considerable force. This abuse may be lessened, and often entirely eliminated by pushing the stick ahead and opening the throttle just as the floats enter the water.

THE MARINE RAILWAY causes less abuse perhaps than any other type of ramp. In this, a carriage, wide enough to accommodate both floats with a comfortable margin, is rolled down rails until its upper edge is just above the water. The ship is taxied gently onto the carriage, which is then dragged out by means of a winch. No sliding on the keels is necessary, as the carriage is brought up to level ground and the ship transferred to some type of beaching gear. Launching, of course, simply reverses the procedure.

If the wind is offshore, the approach to a ramp presents no problems, but when it is blowing toward the ramp it is best to come in directly down-wind if possible, and as slowly as is practicable. Just before reaching the ramp the throttle should be closed so that contact will be made gently. Care should be taken, however, not to close the throttle too soon for if the wind is fresh the ship will swing and strike the ramp sideways. Rather than allowing this to happen it is better to make contact nose first at a fairly good speed. If the wind is quartering, the straight downward rule still applies. The motor should be throttled at such a point that as the ship starts to weathercock into the wind it will strike the ramp with both floats at the same time. This calls for rather nice judgment, but the maneuver can be easily learned with a little practice. If the wind is strong and across the ramp, it is essential to have someone on hand to hold the wing on the down-wind or lee side, as otherwise the ship will swing while sliding up. In a gale, it may even slide sideways directly across the ramp, in which case it will be necessary to come up diagonally.

Flying boats may be slid up exactly like seaplanes, but unless help is on hand the wingtip floats are likely to suffer. Amphibians, of course, are taxied up on their wheels and controlled with brakes. On the turntables, the throttle should be kept open just enough to prevent rolling backwards until wheels are chocked.

In coming in to a float, the approach should always be made up-wind if possible, particularly if there is no help available. (In this and the three succeeding paragraphs the word "float" refers to the landing platform. To avoid confusion the floats of the airplane are referred to as "pontoons.") By proper judgment of speed and distance, the switch may be cut so that the ship coasts up to the float and comes to a stop with the bow of the pontoon or hull just touching the float, giving the pilot ample time to step ashore and secure the ship before it drifts away. Needless to say, great care should be taken that the motor has cooled off sufficiently to stop when the switch is cut. For this reason, it is well to allow at least a couple of minutes of idling before contact is made. After the pilot has disembarked, he can turn the ship so that the passengers will not have to get off over the bow.

THERE are many occasions, however, when an up-wind approach is not feasible. In these cases sailing must be resorted to. And bear in mind in this connection that a little patience saves many a wingtip. A typical condition is shown in Fig. 8. The diagram is self explanatory. It should be remembered that the ship must be *brought to a stop* as it contacts the float, especially if there is

(Turn to page 72)

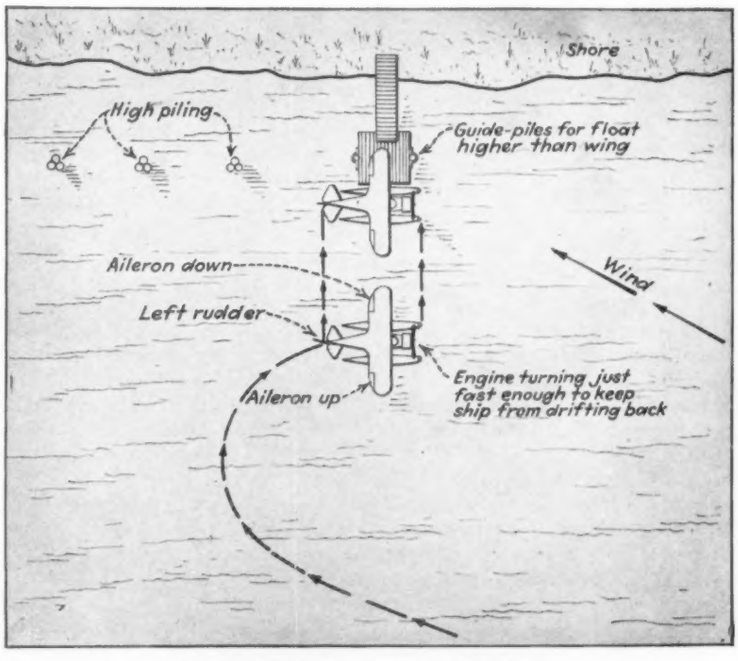


Fig. 8—Sailing saves a wing tip.

How Far?

III.
the Ultimate Maximum Range of Aircraft

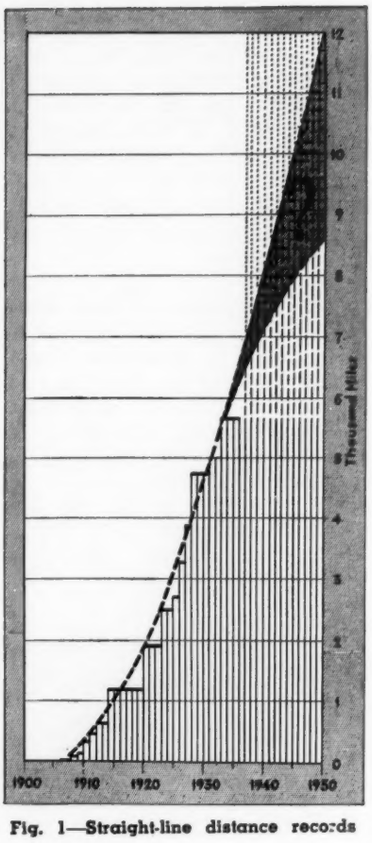


Fig. 1—Straight-line distance records

THE existing official world's record for straight-line nonstop distance very much belies the maximum range possibilities of several existing airplanes. It has, in fact, been claimed to have been unofficially broken, and could easily be broken by stripping and overloading one of the latest airline transports. On the other hand, the establishment of transoceanic commercial air service is causing designers to consider more carefully the factors involved in long-range design.

Fig. 1 shows the progress, from 244 yards in 1906, for the official world's record for straight-line nonstop distance, to 5654 miles in 1933. The less well-known (though more indicative of long-range ability) closed-course record exceeds the straight-line record considerably, but in the final analysis, it is the actual crossing of oceans and continents which excites interest.

Any actual long-distance flight is of course subject to varying meteorological conditions, but a design study must necessarily limit itself to flight under constant and fairly ideal meteorological conditions, such as a steady head-wind, or, more often, calm air, with which this article will be concerned.

The question of maximum endurance is at once similar to, and quite different from, that of maximum range, but the authors do not consider it to be of sufficient practical and general interest to allow space for its consideration in this series of articles. Parenthetically, it must be admitted that maximum endurance does have military value in connection with certain types of missions, and it does have publicity value of a sort. But it does not even enjoy the distinction of being included in the principal official world's records listing.

A design study for an extremely long-range airplane usually entails an involved series of calculations and step-by-step graphical computations. However, the fundamentals are embodied in the familiar Breguet formula

$$R = 863.5 \left(\frac{L}{D}\right) \frac{\eta}{c} \log_{10} \left[\frac{1}{1 - \frac{W_{f_0}}{W}}\right]$$

where R is the range in miles, attained by flying at speeds giving a constant value of the ratio (L/D) of lift to drag, η is the average overall propulsive efficiency, c is the average specific fuel consumption in pounds per brake horsepower per hour, and W_{f_0}/W is the ratio of the weight of fuel and oil to the initial weight of the airplane. This formula at least gives an idea of the order of magnitude of range attainable in calm air, and illustrates the necessity of combining aerodynamic, propulsive, thermal and structural efficiency. (Another important efficiency, i.e., human or piloting efficiency, obviously cannot be included in a formula.)

MAXIMUM range implies flight at speeds near those for maximum lift-drag ratio. Fig. 2 shows the relationships between this ratio and its corresponding indicated speed, and the parameters involved ($C_{D_{pe}}$, the equivalent parasite drag coefficient, is the ratio of f, the equivalent parasite area, to S, the total wing area; it is of the order of 0.0100 for a "flying wing," and may vary between 0.0150 and 0.0250

The third of a series of articles discussing the upper limits of airplane performance.

By

W. C. Rockefeller

Instructor in Aeronautics
California Institute of Technology

and

Dr. Norton B. Moore

Aerodynamics Engineer
Douglas Aircraft Company

for large clean landplanes, and between 0.0200 and 0.0300 for large clean flying boats. e is Oswald's "airplane efficiency factor," defined in N.A.C.A. Report No. 408, and varies from 0.70 to 0.95, depending upon the type of airplane; the "effective" aspect ratio, $e \times A.R.$, is thus $eb^2/S = b_e^2/S$, where b is the span, and $b_e = e^{\frac{1}{2}}b$ is the "effective" span.)

Fig. 2 shows estimates of the maximum lift-drag parameters for the Bleriot 110 (holder of the straight-line non-stop distance record), and for the Russian ANT-25 (specially designed for long-distance flights), and for two well-known transport airplanes. (Indicated speeds shown for these examples are for the initial, or design, weights). Improbable values are indicated by dashed portions of the general curves.

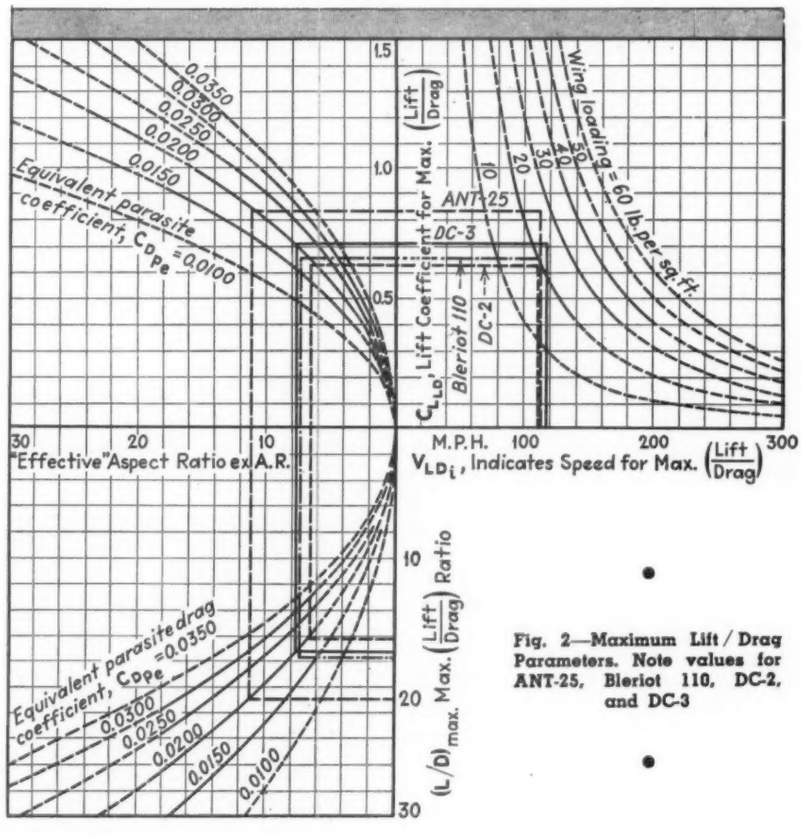


Fig. 2—Maximum Lift / Drag Parameters. Note values for ANT-25, Bleriot 110, DC-2, and DC-3

A STUDY of Fig. 2 will illustrate the difficulty of increasing present-day values of the maximum lift-drag ratio by any extremely large amount, but some improvement can certainly be obtained by special design. Overall propulsive efficiency may be improved somewhat in the future. But the greatest opportunities for improvement lie with the specific fuel consumption and with the fuel and oil weight ratio.

There is no doubt at the present stage of engine development that the compression-ignition engine is superior to the spark-ignition engine for very long-range designs. Similarly, the liquid-cooled vee or in-line spark-ignition engine is superior to the aircooled radial engine, although fuel injection shows promise of bringing the latter to equal footing with the former. Further engine development in all types may alter the relative merits of these engine types (in fact, for very large long-range

(*Turn to page* 75)

How Hard Is a BUMP?

Accelerometers on Airplanes Tell the Story

An S.A.E. paper by

Richard V. Rhode*

Reviewed by

Edward P. Warner

WHEN the Bureau of Air Commerce set out to make airplane stress analysis safe for the logician, its first move was to replace the arbitrary "factors of safety" on commercial airplanes by loads computed on the assumption that the machine flew suddenly into a vertical gust, sharp-edged and of uniform strength, with the abruptness with which it might have struck the side of a building. Now Mr. Rhode, originally responsible for the conventional formula, has produced a new method leading to some strikingly new conclusions.

Not only that, but he has brought the first public report of the researches with the V-g recorder on which the N.A.C.A. and several air transport lines have cooperated over the past five years, on the actual loads encountered in flight. The curves reproduced show how nearly the Department of Commerce rule of 30 ft. per sec. for a sharp-edged gust fits the worst cases that are at all typical of a large amount of flying. They show, too, how rapidly the worst gust conditions apparently experienced taper off at speeds above the maximum for level flight, or even (in the case of the flying boats) above the speed of cruising; the explanation lying partly in the relatively small proportion of its total life during which an airplane is flying at above 0.9 V_{max}; partly in the superior discretion that transport pilots display in keeping the speed to moderate figures when they know the air to be rough.

The 30-ft. gust is typical of the worst conditions; but it is not the limit. A certain DC-2 which flew through a line squall at low altitude a few months ago showed a load factor of —2.5 at 186 m.p.h.; representing, for that particular airplane, an apparent gust velocity of 47 ft. per sec. By a curious coincidence, the highest gust velocity deduced from any test previously made on a non-transport airplane was also 47 ft. per sec.; the machine being a Lockheed Orion, the pilot Major Doolittle, the terrain mountainous, the altitude "very low," the load factor imposed 5.1. In that case the gust was upward; on the DC-2, downward. The DC-2 showed no sign of structural damage. That bore encouraging testimony to the typical strength of transport planes.

Mr. Rhode's search for a more refined gust formula had been prompted by a fear that the present method might not do full justice as between airplanes widely differing in size and in other characteristics. Anyone who pauses to reflect must realize the physical impossibility of a sharp-edged gust, with the air at one point motionless and that a few inches away rushing along with a vertical velocity of 30 or 40 ft. per sec. The need for a layer of gradual transition is obvious; and the airplane flying through that layer can accommodate itself gradually to the changing conditions, with a load factor duly reduced below that which would exist if the same vertical current had

**Presented to the Society of Automotive Engineers, at its annual meeting. The specific records herein contained, and the direct deductions from the mathematical work, are all Mr. Rhode's. Some of the generalizations and statements of opinion, however, have been inserted by the reviewer.*

been entered with absolute abruptness.

Furthermore, even if the impossible were the fact, and if the gust's boundaries were indeed sharp, the conventional formula still would not be correct. Flow photographs of model airfoils started from rest, and moved through still air, show that they must move some six chord-lengths before the circulation of fluid around the section takes on the appearance that it will keep in a long-continued steady motion. Gradually developing circulation means gradually developing force; and the same principle applies when a moving wing makes a sudden change in its angle of attack. It may take a considerable fraction of a second for the lift to change to a close approximation of its permanent value for the new angle; and during that instant of time the gradually increasing lift is gradually accelerating the airplane vertically, adjusting it to the new direction of the apparent wind and partially neutralizing the change in angle of attack that the encounter with the gust initially caused. By the time the lift is built up to an equilibrium value, the equilibrium is for an intermediate angle of attack. The effect on the load on the wing is then but a part of what it would have been if, as the gust formula assumes, the adjustment of the relation between the angle of attack and the lift were always instantaneous.

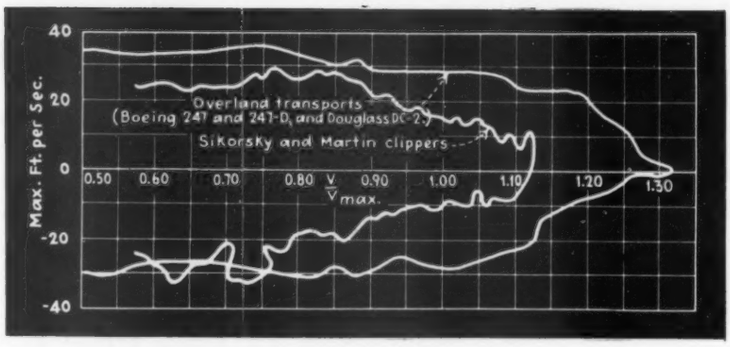
From the work of Wagner and Kussner on the fashion in which the lift is in fact built up, Rhode has calculated the percentage of reduction of load below the values indicated by the simple ideal-gust formula. With a gust in fact sharp-edged, the reduction ranges from 46 per cent with a wing chord of 30 ft. and a loading of 8 lb. per sq.ft. down to 18 per cent with a 5-ft. chord and a 30-lb. loading. Since the lightest wing loadings are commonly found on small airplanes, and vice versa, it is not far off the mark to assume a 32 per cent reduction in all cases, though for a racing machine the figure would be somewhat less.

The conventional 30-ft. gust required by the Bureau of Air Commerce is then a fictitious one, of imaginary properties. The 30-ft. velocity is the "effective" velocity which produces certain results; but it actually corresponds, even for a sharp-edged gust, to a true velocity of 30/0.68 or 44 ft. per sec. In the same way, the 47-ft. effective velocities worked out by the customary method from the V-g records on the DC-2 and the Orion previously referred to would have been, to produce the acceleration readings that they did, true gust velocities of 69 ft. per sec., had the gusts been sharp-edged.

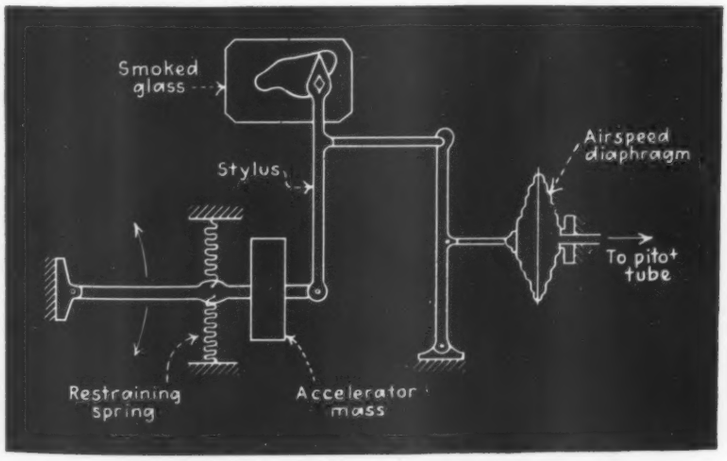
But gusts, as already observed, cannot be sharp-edged. And when they are not, there is a further reduction. If the transitional zone is 400 ft. wide, with the gust velocity increasing uniformly over that distance, Rhode's calculations show a total ratio of reduction of load factor ranging from 77 per cent with a 6-lb. wing loading down to 49 per cent at 30 lb. per sq.ft.,—the chord length making but little difference in this case.

It is not easy to measure gust structure, but a little progress has been made at Langley Field. So far as it goes, it indicates a bordering zone increasing in width as the gust increases in intensity,— as might have been expected,—and reaching a probable maximum of 400 ft. for gusts with true velocity of about 55 ft. per sec. For the most heavily-loaded airplanes, the true added load factors are then but half what they would be if the gust, while keeping the same true velocity, were sharp-edged and able instantaneously to produce its full effect upon the lift; or, to look at the same data from the opposite side, the effective gust velocity of 30 ft. per sec., traditional in design, represents a true gust of 60 ft. per sec. For a light plane, with a 6-lb. wing loading, the 30-ft. effective would be 120 ft. true; a higher vertical velocity than has ever been suspected by meteorologists to exist anywhere outside the core of a tornado.

(*Turn to page 69*)



These records represent a combined experience of our 20,000 hours of commercial flying with V-g recorders.



How the V-g recorder works. From the record traced on the smoked glass, curves of actual gust velocity against airplane speed (shown above) may be calculated

EDITORIALS

AVIATION
FEBRUARY 1937

ETERNAL VIGILANCE IS THE PRICE

▶J. Q. Public is a Tough Guy, — and can he take it! Day after day the highways of the land are strewn with his mangled corpses — about 35,000 a year, — and every day he tosses legs and arms into roadside ditches with reckless abandon.

But when it comes to airplanes, Old John is a bit of a Softy. Quite all right for Uncle Bill, Aunt Min, the Kids and the Pup to be scooped up and brought home in a basket after a friendly brush with a coal truck on Route 6. They get laid away in the Family Plot next day, and except for Uncle Bill's creditors and the local mortician, nobody is much the wiser. But let Uncle Bill and Aunt Min get tangled up with a mountain top in a storm-tossed airplane — and there's Hell to Pay. Their passing is accompanied by the Blowing of Trumpets and by loud offstage Alarums and Excursions.

It is a curious fact, — but a fact nevertheless that must be recognized, — that people still don't like to be killed in airplanes. There is something about it that they resent.

And we think they are right.

No one believes more thoroughly in the present and future of air transportation than do we, individually and collectively. We use the airlines on every possible occasion and shall continue to do so, and we stand ready to cooperate with every agency — governmental and private — in the advancement of flying for safe, swift, comfortable, and cheap transport.

But you fellows who sit in Washington holding the purse-strings, — you fellows who sit in airline headquarters fixing operating policies, — you fellows who sit in airport watchtowers dispatching ships, — you fellows who sit in cockpits have all got to realize clearly that public sentiment will stand for just so much.

During the past year the public has been making phenomenal use of our air services. Never before have passenger miles piled up as they did in 1936. Never before has traffic held up to summer levels well into the winter months. But 29 deaths in the course of a few weeks is hard to take. We are in more than a little danger of seeing hard earned ground cut away under our feet. We've got to make up our minds that if we never have another accident it will be too soon.

In 1935 the railroads hung up a record of no fatalities in some 7 billion passenger miles of travel. That is the sort of thing we in air transport must attain before we can sit back and be comfortably content.

AUTOGIRO APPLICATION

AVIATION HAS ALWAYS FELT that rotating wing aircraft should not be judged solely against standards set by conventional types. Although autogiros probably can never compete on grounds of high speed and extreme range, they do have peculiar capabilities and may be fitted into specialized jobs that the airplane can never handle effectively.

England and France have recognized that fact, and as a part of their intensive rearmament programs are both paying more attention to the autogiro than ever before. As a fighting machine the giro is obviously out, but for observation and for liaison it offers attractive possibilities. Each country has placed orders for the machines in relatively large quantities.

Admittedly, replacement of the expensive and vulnerable sausage balloons by autogiro is no new idea, but the use for liaison now seems to hold the greatest attraction. The old system which sent the Brass Hats tearing about on motorcycles on roads already cluttered with transport often breaks down completely under combat conditions, but when contacts can be made by hedge-hopping in giros, both the transport and the liaison profit. In last year's maneuvers, staff officers were transported quickly and easily from headquarters to line positions, from battery to battery behind fronts in giros.

Here is something to which our own General Staff ought to give serious consideration. The Air Corps has shown decided antipathy to the autogiro, but some of the general officers of the artillery and the cavalry have already recognized its usefulness. They find difficulty, however, in procuring them under present Army rulings. Certainly if other countries are finding these machines useful for cooperation with ground troops, the way ought to be cleared so that our own ground forces could at least give the idea a workout to see what there is in it.

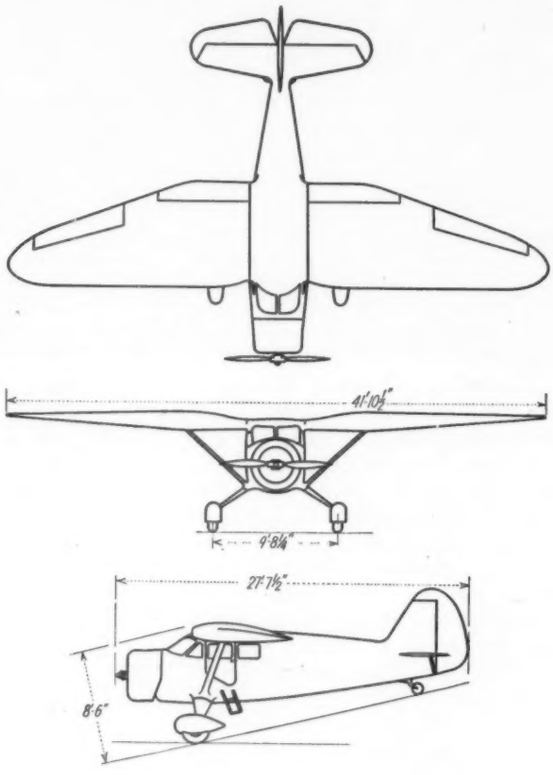
MAINTENANCE AWARD

FOR MANY YEARS AVIATION has been actively interested in problems of air line (and other aircraft) maintenance.

Realizing the importance of the part played by maintenance personnel in the development of our great air transport systems, AVIATION'S MAINTENANCE AWARD has been established to be "presented annually . . . in recognition of outstanding contribution to the field of maintenance of equipment in Air Transportation." The award itself consists of a bronze placque, to be held for one year by the person selected by the award committee. The name of each year's winner will be engraved on the face of the placque. The story of the 1937 award appears on page 53 of this issue.

STINSON RESTYLES

1937 Model Reliant is faster and has many refinements



ALL OF THE DEVICES for safety and maintenance built into the Stinson Trimotored Airliners are contained in the 1937 Reliant. The new ship retains the characteristic gull wing of last year's model but is faster and roomier than its predecessors. It lands and stops in a shorter distance. It is equipped with more effective soundproofing, a new ventilating and heating system, a device to eliminate carburetor icing and many other detailed refinements. All these modifications follow the Stinson policy of constant improvement without basic changes, according to B. D. De Weese, president of the company, who announced the specifications. Three Lycoming and two Wright powered models of the new ship are available.

Designed for the pilot having limited experience, the 1937 Reliant has a wide tread landing gear to improve maneuverability on the ground. Maintenance bills are reduced by the shock absorber system which consists of improved Springdraulic shock absorbers on the main landing gear and a twin-action oleo shock absorber on the pneumatic tail wheel. More efficient vacuum flaps with slots permit descent slower than a parachute and make slower landing speeds possible. With the use of these devices and the disc type hydraulic brakes, a landing run of 250 ft. is possible.

A new type windshield designed for better vision, and a side window which may be lowered in the air or on the ground have been incorporated to improve ground handling at crowded airports and in bad weather. Safety glass is used throughout. Wide side windows in the doors also furnish an unobstructed view of the ground.

Dignified styling and comfort and convenience characterize the interior of the new Reliant. Interiors are tailored

Flying Equipment

What's new in aircraft, engines and major accessories

The Stinson Reliant for 1937

in tufted broadcloth or soft grained leathers. The ceiling is rounded at the sides and rear and new hardware, window mouldings, instrument panel, and lighting fixtures add to the harmony of design.

Two wide doors, long steps and fixed assist grips facilitate entrance to the cabin. The rear seat for three persons is 52 in. wide. The cabin has been lengthened to provide more leg room. All seats have been made higher to furnish additional support for back and shoulders. Pilots' seats may be adjusted fore and aft and the backs may be set in three reclining positions. Rudder pedals also are adjustable. The self-lighting separate luggage compartment has been enlarged.

Ventilation and sound absorbtion have been greatly improved. Fresh air under pressure is led into the cabin from ducts in the wings. Four inlets are provided in the cabin and pressure, flow direction, and temperature are controllable. The air outlet is in a low position forward, sucking engine heat out of the cabin before it reaches the passengers. Since it was unnecessary to use the windows for ventilation, it became practicable to develop the cabin soundproofing. The floor, forward wall between the engine compartment and cabin, the sides, and headlining have been generously stuffed with pads of porous fibre. Together with the dead air space, these pads resist the transmition of sound from the forward part of the fuselage to the cabin.

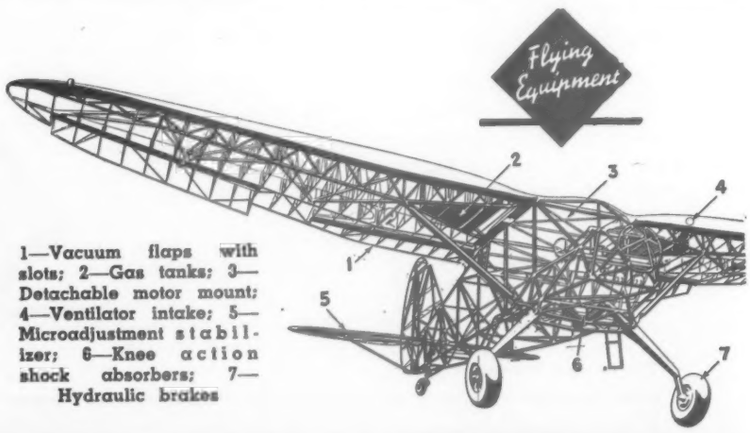
Load carrying capacity has been increased by the use of controllable pitch propellers and the ship is available with either the Lycoming-Smith or Hamilton Standard types. Other equipment includes electric starters, generators on most models, dual Scintilla ignition, rubber cradled motor mounts, and a device used by the airlines to eliminate carburetor icing and heat the engine oil in cold weather.

Like other Stinson airplanes the new Reliant has metal wing and fuselage structure and fabric covering. The fuselage is of conventional welded chrome molybdenum steel tube construction. The wing is built up of two spars, the front of welded chrome molybdenum steel, the rear of duralumin. Ribs and leading edge are also of dural and compression struts are steel tubes.

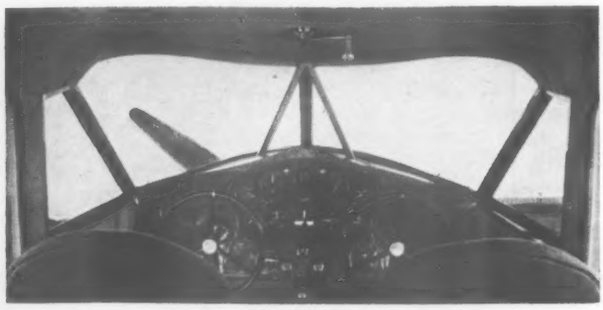
Tooled for production late in 1936, the Stinson factory is now delivering the largest booking of December orders in the corporation's history.

Specifications and performance of the several models follow:

Model, Engine, Propeller	SR9B 245 hp. Lycoming, Lycoming, Smith	SR9BD 245 hp. Lycoming Hamilton	SR9CD 260 hp. Lycoming Hamilton	SR9DD 285 hp. Wright Hamilton	SR9ED 320 hp. Wright Hamilton
Span	41 ft. 10½ in.	41 ft. 10½ in.	41 ft. 10½ in.	41 ft. 10½ in.	41 ft. 10½ in.
Length	27 ft. 7½ in.	27 ft. 7½ in.	27 ft. 7½ in.	27 ft. 7½ in.	27 ft. 7½ in.
Height	8 ft. 6 in.	8 ft. 6 in.	8 ft. 6 in.	8 ft. 6 in.	8 ft. 6 in.
Weight empty	2467 lb.	2480 lb.	2515 lb.	2640 lb.	2640 lb.
Useful load	1243 lb.	1220 lb.	1235 lb.	1310 lb.	1410 lb.
Gross Weight	3700 lb.	3700 lb.	3750 lb.	3950 lb.	4050 lb.
Cruising Speed (Optimum Attitude)	143 m.p.h.	143 m.p.h.	145 m.p.h.	156 m.p.h.	161 m.p.h.
Rate of climb	800 f.p.m.	800 f.p.m.	825 f.p.m.	875 f.p.m.	1050 f.p.m.
Service Ceiling	13,200 ft.	13,200 ft.	14,500 ft.	15,500 ft.	17,500 ft.
Range	615 mi. (70 U.S. Gal.)	615 mi. (70 U.S. Gal.)	630 mi. (70 U.S. Gal.)	625 mi. (80 U.S. Gal.)	700 mi. (80 U.S. Gal.)



1—Vacuum flaps with slots; 2—Gas tanks; 3—Detachable motor mount; 4—Ventilator intake; 5—Microadjustment stabilizer; 6—Knee action shock absorbers; 7—Hydraulic brakes



Left: This might be any high priced automobile. Above: The instrument board is compact and convenient and the vision is good

Edo Amphibious Gear

New type of seaplane float incorporates retractable wheel

DESIGNED by Edo engineers and sponsored by the Development Section of the Air Commerce Bureau, an amphibious float gear for seaplanes has just received its ATC (No. AC-73), at College Point, L. I.

Although the new amphibious gear was designed and built in less than a year, its development is based on five years of research during which three distinct types were built and tested.

Outwardly the gear has the appearance of a standard Edo float. When the water rudder is retracted, however, it is seen that the transom is fitted with a roller of generous proportions which protrudes slightly below it, while the bottom is curved sharply downward, heavily armored, and surfaced with Stellite at the center. The last four feet of the float are built as a separate, removable section, hinged at the deck and fitted with a Bendix shock strut, which, by means of an ingenious linkage, provides the tail with seven inches of oleo sprung travel.

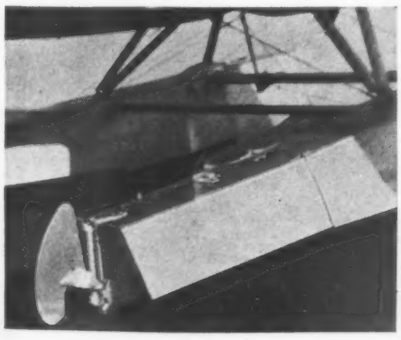
Each of the main landing gear wheels is supported by a pivoted yoke, which is linked through a Bendix shock strut to a small crank concealed under the deck. Cranks are operated in unison by a handle in the pilot's cockpit through an irreversible worm gear and rotate through 190 deg., locking in both "down" and "up" positions. The wheels retract completely into apertures in the float bottoms. Brakes are tied into the control system.

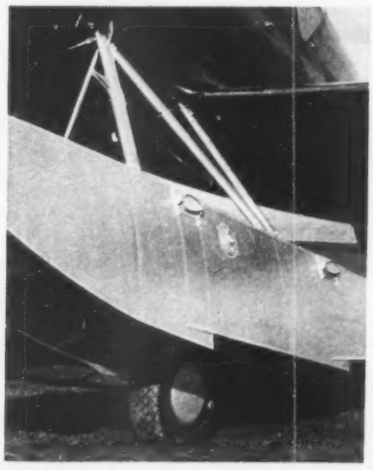
Wheels are well forward of the c.g. and a secondary step is placed ahead of them to shield the bottom opening from water interference. The wheel compartments are air tight at the top so that buoyancy is retained through diving bell effect. Heavy keels at all wearing points on the bottom make it possible to use the ship as a seaplane.

Alclad sheet is used in construction with anodically treated duralumin rivets, castings, and extruded sections. The familiar longitudinal flutes on the forward bottom are displaced by the use of the secondary steps. The simple monocoque structure and all of the features for simplified maintenance in standard Edo floats are retained. Additional weight of wheel gear totals about 175 lb.

Two models will be produced this season to provide for ships in the 4-5 place class weighing 3,500-4,000 lb., of Beechcraft, Stinson, and Waco manufacture.

More Flying Equipment on page 41





Left: Rear section of float is hinged. Right: In "wheels down" position

The wheel retracting mechanism and the hinged rear section

You'll find

IT'S *all* LUBRICANT

TWA uses Texaco Airplane Oil. So do Braniff, Pennsylvania, Hanford, Northwest, and Wyoming. They selected this oil only after extensive tests.

Texaco Airplane Oil keeps its body under high temperatures, yet flows freely in extreme cold.

It will give you longer periods between oil changes, greater freedom from clogged oil lines, stuck rings, leaky valves.

A Texaco representative will be glad to provide practical engineering service to prove the economy of Texaco Airplane Oil.

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Texaco Aviation Products are used by three-quarters of the nation's major airlines.

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● ***Whenever you see a line-up of airplanes count noses*** . . . **It's a safe bet that the Wacos far outnumber all others.**

Waco has always been America's most popular airplane. Latest Bureau of Air Commerce figures show nearly forty percent more Wacos in licensed operation than any other make, *regardless of price* . . . A Waco demonstration will show you the reason.

THE WACO AIRCRAFT COMPANY • TROY, OHIO

WACO AIRPLANES

A recent picture taken at Union Air Terminal, Burbank, showing twelve privately owned Wacos.

Dragon Bomber

North American ship has long range and large load capacity

D. W. (TOMMY) TOMLINSON recently stepped out of his role as vice-president of TWA long enough to run a series of flight tests on North American Aviation's new "Dragon," a long range, heavy bomber built to the specifications of the Army Air Corps. Designed and built in strict secrecy at the plant on Los Angeles Municipal Airport, the new bomber is said to exceed in range and load capacity any airplane of its type ever produced. It was developed under the direction of J. H. Kindelberger, president of North American; J. H. Atwood, chief engineer; and Carl Hansen, project engineer.

The Dragon is a twin engined (P. & W., 1,250 hp.) midwing monoplane having a fuselage 12 ft. deep and 7 ft. wide at the maximum section. Accommodations for a crew of ten are provided to man the elaborate bombing equipment and defensive armament. Crews' quarters are heated, ventilated, and sound-proofed, the cabin being sealed for comfort at high altitudes. Two bunks are provided to permit a portion of the crew to sleep during long trips. The pilot's control room is exceptionally large, having adjustable passenger type upholstered seats for four,—ship's captain, pilot, co-pilot and operator.

1,000 lb. of structural weight are saved and maneuverability is improved by elimination of separate fuel tanks. Gasoline is carried in the central portion of the skin stressed wing. The reservoir consists of four compartments sealed with DuPrene. Concentration of the fuel load near the c.g. improves the maneuverability.

Wing panels are of single spar, stressed skin construction. A new type of flap with automatic hydraulic control provides good speed range and low landing speed. To reduce control load and insure against flutter the ailerons are balanced aerodynamically, statically, and dynamically.

Fuselage construction is semi-monocoque. In spite of the large cross sectional area to provide turrets and bomb sights, the aerodynamical characteristics have been refined to the point where drag is low.

Provision is made for either the Curtiss or Hamilton Standard type of three-blade, constant speed, feathering propellers, equipped with slinger rings for ice prevention. Goodrich deicers are also part of the equipment. The Sperry automatic pilot is also included.

Landing gear is simple and rugged. It is retracted hydraulically but may be operated mechanically in emergencies through an independent system.

Defensive armament is designed so that 3 to 5 guns can be brought to bear on any point around the airplane to defend it against pursuit attack. Gun mounts are designed to operate efficiently in the rarified atmosphere at high altitudes.

The ship will be entered in an Air Corps competition next month.

The NA-21, Dragon Bomber by North American.

The North American Corps and Army Observation Plane.

N. A. Observation

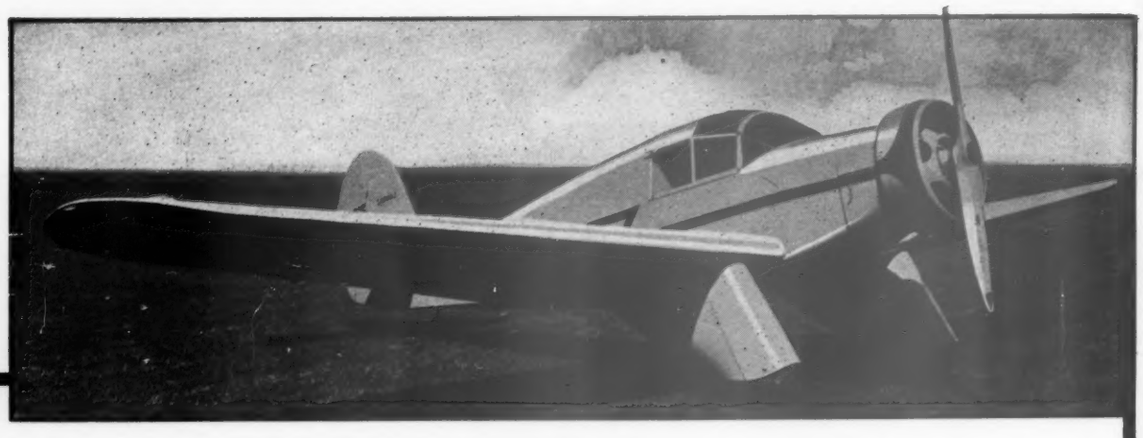
Air Corps Buys 120 ships of New Type From North American

SECOND ARMY CONTRACT received by North American Aviation Inc., within a month is for 120 Observation planes of a design that won the recent Air Corps competition at Wright Field. Production on this model will begin next summer.

The three-place Corps and Army Observation plane is of the all-metal, mid-wing type. In its design the specific requirements of the observer have been kept in mind. In addition to the observer, a pilot and gunner are carried. The observer has ample room for photographic work, mapping and general observation. He also has an upper position for radio work and relief piloting. The gunner is located in the rear for defensive purposes.

Contributing to the performance of the ship are retractable landing gear and tail wheel, streamlined fuselage and improved tail group form, and a specially designed engine cowling.

SIX YEARS' PERFORMANCE on the C-3 EARNS ITS RIGHT to be on the AERONCA LOW-WING!



FEW are the registered thousands of airports in America that do not have an Aeronca C-3 glide down onto the runway. For it's that kind of ship. World famous, nationally popular, it has earned its way into private flying on performance.

So it's important news when a firm renowned for this ship, adopts that super-soft shock-absorbing air cushion—the Goodyear Airwheel* for its newest contribution to the airlanes—the new Aeronca low-wing.

In making the decision J. C. Welsch, for the Aeronautical Corporation of America, writes: "As you know, we have been using Goodyear Airwheels on the Aeronca C-3 for the past six years. After having exceptionally satisfactory service from this equipment we did not consider it necessary to look elsewhere for wheels, tires or brakes for our new low-wing. This makes use of Goodyear wheels, tires and brakes 100% on Aeronca models."

In countless tests Goodyear Airwheels have proved they are the safest equipment underwheel. They literally cushion every landing. They turn forced landings in plowed ground, corduroy fields and snow and sand into smooth landings. They are particularly a safety factor in student flying. They relieve all ships of the ground strain and stress of any landing and they lighten the shock of every bounce-in landing.

Adding all these up it is easy to understand why more and more manufacturers are choosing Goodyear Airwheels. And why more and more passenger lines are adopting them for every ship in the run. Perhaps they are enough reasons for you to switch over to Goodyear on your own ship—remember Airwheels are first choice for safety.

***IF IT ISN'T A GOODYEAR IT ISN'T AN AIRWHEEL**

AIRWHEEL *is Goodyear's trademark, registered in the U. S. A. and throughout the world, and is used to denote that Goodyear is the exclusive maker of* AIRWHEEL *Tires*

THE GREATEST NAME IN RUBBER

GOODYEAR

ON YOUR NEW SHIP SPECIFY GOODYEAR AIRWHEELS AND GOODYEAR AIRPLANE BRAKES

CCFN-1 Trainer

Canadian Car & Foundry offers two place biplane

A NEW TRAINER has been added to the line of products offered by the Canadian Car and Foundry Company. Simple in construction and low in cost the CCFN-1 is a two place sesquiplane with tandem seating, powered with either the 100 or 125 hp. Kinner or 145 hp. Warner engines.

The wing cellule consists of a center section and four panels. Rectangular section solid spruce spars and wooden ribs without nails are used. In large production metal ribs will be substituted. All bracing struts and fittings are of chrome molybdenum steel tubing. Square swaged wire is also used in the internal bracing. Alclad sheet is used for the leading edge to rear spar. Ailerons, on the upper panels only, are built up of welded chrome molybdenum steel tubing. Covering is fabric.

The fuselage is a normal welded steel tube structure without wire bracing. Metal covering is used forward and fabric in the rear sections. The N.A.C.A. engine cowling is split and can be swung open or removed for servicing without disturbing the propeller. A luggage compartment in the rear is accessible through a door in the side of the fuselage.

Tail surfaces are of welded chrome molybdenum steel construction. A collar fitting for the rear stabilizer tube allows it to swivel and eliminates the torsional stresses of the plain lug type fitting. Vertical surfaces are of the cantilever type while the horizontal members are externally braced. Elevators have trimming tabs controllable from either seat. An adjustable stabilizer is optional.

Landing gear consists of two separate units with main legs of the oleo type and pyramid mountings. Telescopic tubes are interconnected with large scissor hinges to prevent the lower tube from swiveling. 6.50x10 low pressure tires and wheel brakes are provided. An 8-in. streamline tail wheel is mounted to swivel 360 deg. The mounting socket is designed to take optional skid equipment.

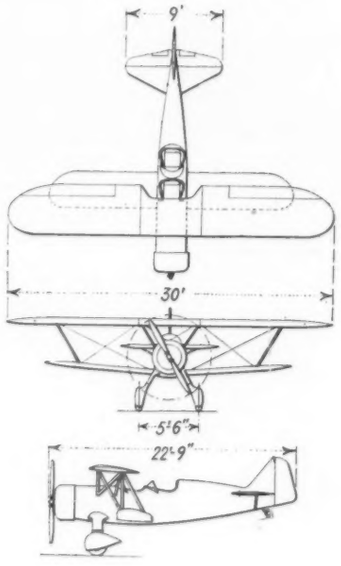
The detachable engine mount is designed for several makes and types of engines. Fuel and oil tanks are cradled on the engine mount with fuel shut-offs in either cockpit.

Stick and rudder pedals are standard equipment and front cockpit controls are readily detachable. Ball bearing are used extensively in the control system. Individual windshields for both cockpits or a tunnel type enclosure are available.

Specifications of the CCFN-1 are: Span (upper) 30 ft.; lower, 22 ft. 7 in.; length, 22 ft. 9 in.; height, 8 ft. 3 in.; wing area, 200 sq. ft.; tread 5 ft. 8 in.

Characteristics

Engine	100 hp. Kinner	125 hp. Kinner	145 hp. Warner
Fuel Cap. in Gal...	39	39	39
Oil	4	4	4
Weight (Gross) Lbs.	1,750	1,790	1,950
Empty	1,070	1,110	1,270
Useful	680	680	680
Speed—Maximum (m.p.h.).	112	123	136
Cruising.	97	109	122
Landing.	44	45	47
Climb (Ft.) (Min.)	590	869	895
Ceiling Service (Ft.)	10,500	12,800	15,900
Range Cruising (Mi.)	616	515	588



Portable Learadio

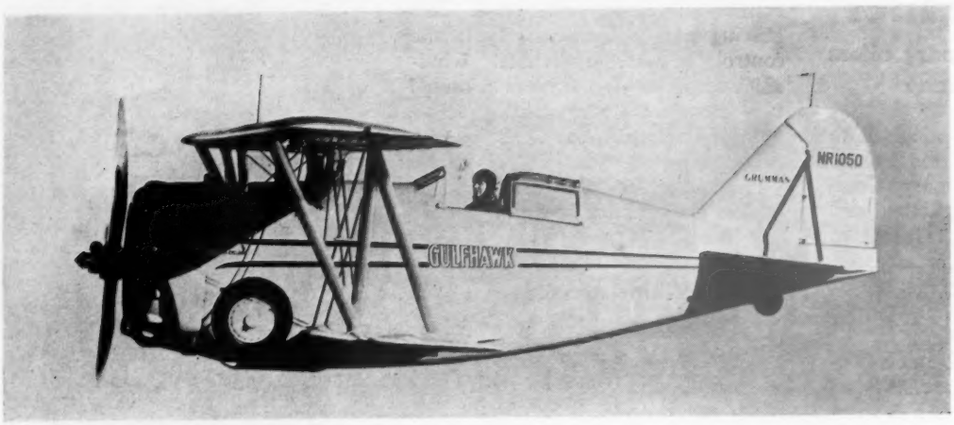
Light-Weight Radio Transmitter and Receiver for Field Use

FEATURING LIGHT WEIGHT AND RUGGED CONSTRUCTION, and developed primarily for use in bush country where communications are difficult, a new two way portable radio unit offered by Learadio (New York, N. Y.) will prove of special interest to operators of air charter and freight service, military air units, and others.

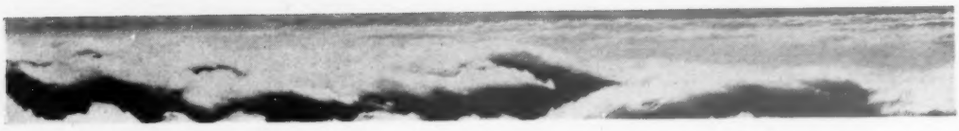
Designed to provide day and night two way communication up to 300 miles by radio telephone, and over even longer distances by use of telegraphy, the new Lear unit has 7 tubes in all, is specially designed for hard service and long use without adjustment, employs an antenna designed for difficult transmission from poor sub-soil terrain, requires only a few minutes to set up and get operating on any ordinary type of gasoline, and weighs only 25 lb. The unit consists of a small single cylinder gasoline engine of four cycle valve-in-head type, driving an alternator delivering 200 watts at 110 volts, and enclosed in a substantial duralumin case. The unit puts out between 20 and 30 watts, 100 per cent modulated, on telephone or telegraph, crystal frequency stabilized for both transmission and reception to insure that mistuning will not prevent completion of scheduled contacts. The receiver normally works into a small loudspeaker which is automatically cut out when headphones are plugged in. An anti-noise type close-talking microphone is provided for transmission. It has a button control which, when depressed, turns off the receiver and turns on the transmitter. The same antenna is used for both transmission and reception. The unit is designed for any frequency range from 3000-10,000 KC, or from 30 to 100 meters. The design is based on the use of two identical units, one at the base and one at the field of operation, both tuned to the same frequency and held there by the piezo crystal oscillator.

Gasoline consumption is about one pint per hour, the tank holding sufficient fuel for approximately three hours' operation.

Learadio portable generator unit

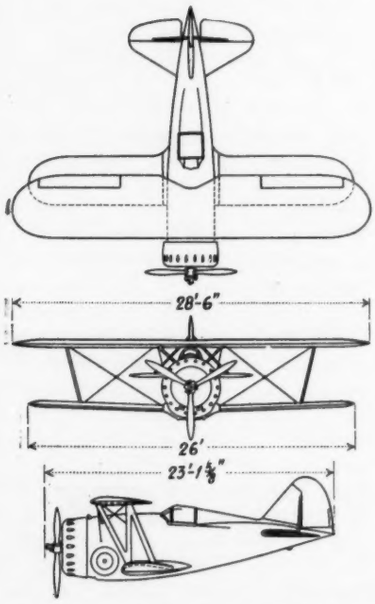


ONE FOR AL



Grumman builds special acrobatic Gulfhawk for Al Williams

Flying Equipment



The Grumman Gulfhawk is a high performance acrobatic ship designed especially for Al Williams

DESIGNED-PARTICULARLY for high performance and acrobatics but also adaptable for cross-country flying, Al Williams' new Gulfhawk has just been completed at the Grumman factory. The new Gulfhawk (Model G-22) has no unusual structural features. It is built to high load factors and has an exceptionally large tail for maneuverability. The engine is a Wright Cyclone G with a 3-blade Hamilton Standard controllable pitch propeller.

Among the outstanding features is the equipment for upside down flying. Gasoline and oil tanks have several outlets, one of which is at the geometric center of the tank in each case. A second scavenger pump and five drain lines have been added to the regular engine installations. By the use of this equipment it is possible to fly in inverted positions for about one-half hour.

Special accessories include an improved model of the Coffman Cartridge Starter (AVIATION, Oct. 1936) with the breech in the cockpit where it can be loaded by the pilot. Other equipment includes a Sperry Artificial Horizon Directional Gyro and a Cambridge Exhaust Gas Analyzer.

Dimensions and specifications are as follows:

Span (upper wing)	28 ft. 6 in.
Length overall	23 ft. 1⅝ in.
Gross weight (144 gal. fuel)	4195 lb.
Gross weight (42 gal. fuel)	3583 lb.
Maximum speed (12,000 ft.)	290 m.p.h.
Cruising speeds:	
900 mi. range	250 m.p.h.
1,000 mi. range	225 m.p.h.
1,180 mi. range	200 m.p.h.
1,500 mi. range	175 m.p.h.
Rate of climb	3,500 ft. per min.
Ceiling	26,000 ft.

CURTISS-WRIGHT CORPORATION

CURTISS AEROPLANE DIVISION

BUFFALO · NEW YORK

UNITED AIRLINES
now flies DOUGLAS
"Douglas DC-3" fleet...the culmination of "Aircraftsmanship", maintaining regular schedules over UNITED AIR LINES...inaugurates a new high in air travel.
These luxurious sky pullmans...equipped with every proved complement to passenger comfort and operating efficiency...reflect the ultimate in Flight Security.
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A SUBSIDIARY OF THE BENDIX AVIATION CORPORATION

Miles Mohawk

Col. Lindbergh's British Plane Has Menasco Engine

THE OUTSTANDING SUCCESS of all Lindbergh flights is due in no small measure to careful and persistent attention to details in preliminary arrangements and equipment design. This same meticulousness has gone into the design of the new Miles Mohawk just completed for Col. Lindbergh by Phillips & Powis Aircraft Ltd. of Reading Aerodrome in England. The designer is F. G. Miles who has turned out a number of British sport planes.

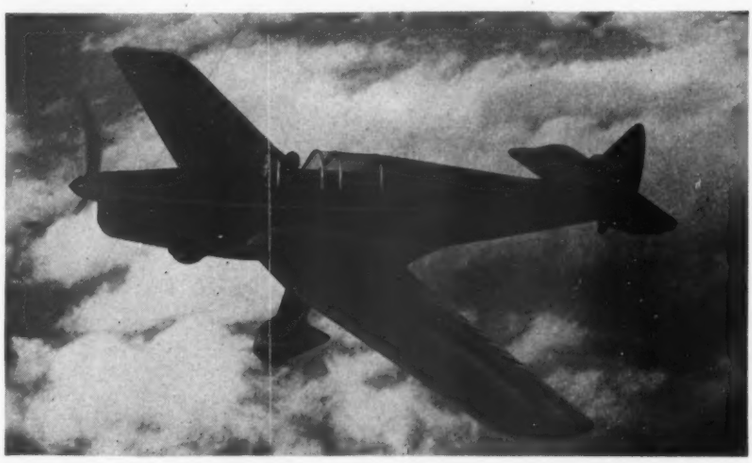
Although the airplane is British in design and manufacture, an American engine was selected. It is a 6-cylinder in-line supercharged Menasco B6S, rated at 200-270 hp. Arrangements have been made separately by Phillips & Powis to manufacture Menasco engines under license in England and a plant for the purpose is planned.

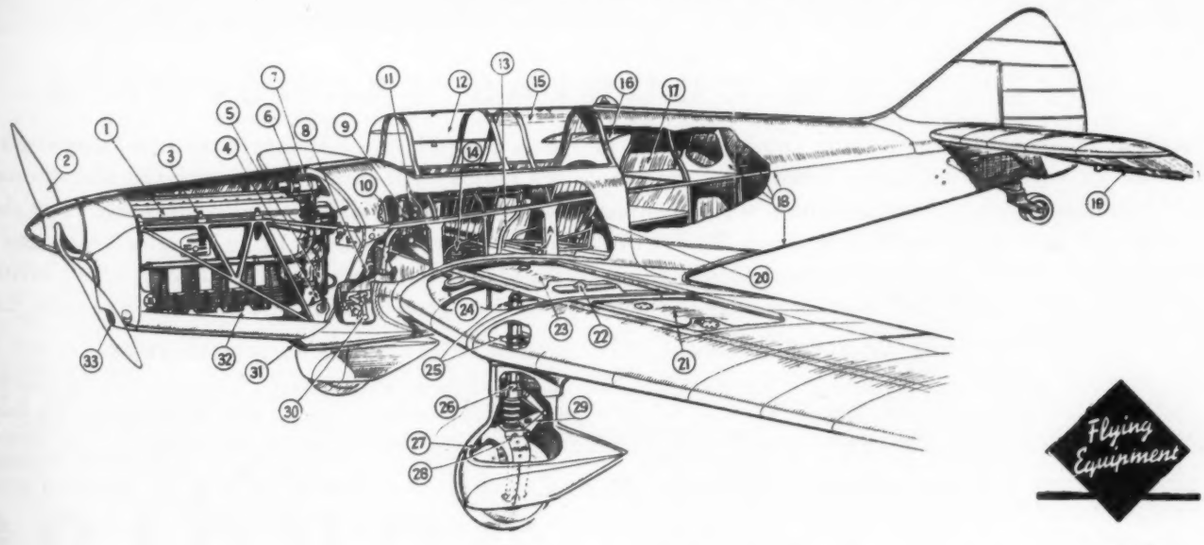
The Mohawk is a two-place low-wing monoplane of construction similar to that of other Miles designs—wood and fabric throughout with cantilever wings and tail. To provide control up to and beyond the stalling angle and a steep gliding angle, Miles patented spit trailing edge flaps are installed. A single Lockheed shock absorber is used for each wheel, and brakes are included in the landing gear equipment. Provision is made for quick substitution of seaplane float equipment.

A tandem seating arrangement is used with the back seat adjustable. Transparent panels slide up from each side of the cockpits to form an enclosure. Dual controls are provided. A full set of instruments and equipment including parachute flare apparatus of American manufacture are included.

Specifications are:

Span	35 ft.
Height	6 ft.
Span folded	16 ft. 6 in.
Wing Area	182.75 sq. ft.
Weight Empty	1,605 lb.
Gross weight	2,700 lb.





1. "Menasco Buccaneer" Motor; 2. V. P. Airscrew; 3. Motor Spring Mounting; 4. Carburetor; 5. Supercharger; 6. Generator; 7. Starter; 8. Fuel Cock; 9. Fuel Selector Switch; 10. Inst .Panel; 11. Wheel-Brake and Throttle; 12. Slide-Up Windows; 13. Dual Stick & Rudder Bar; 14. Tail Trim; 15. Slide-Up Windows; 16. Luggage Door; 17. Stepped-up Luggage Compartment; 18. Wooden Longerons, Ribs, and Formers Above; 19. Trim Tab; 20. Seat Hinged to Back Spar at A, Seat-Back plugs into seat base, Remove the seat backs and a stretcher bed could be laid on longerons right along cockpit; 21. Outboard Fuel Tank; 22. Breather on Wings; 23. Inboard Fuel Tank; 24. Oil Tank; 25. Two Sleeves to Main Spar and One Fixing Bolt; 26. Lockheed Leg; 27. Bendix Brake; 28. Air Valve; 29. Torque Brace; 30. Pedal Type Rudder Bars; 31. Carburetor Air Inlet; 32. Induction Manifold from Supercharger; 33. Cooling Air Inlet.

Flying Equipment

The Great Silver Fleet **GREATER STILL**

WITH NEW DOUGLAS TRANSPORTS

Step out of winter into the warm comfort of one of Eastern Air Lines' latest Douglas Transports... and you will be in Florida in less than eight hours. * Augmenting its Douglas service already famous from New York, Philadelphia, Baltimore, Washington and Chicago to the South, the Great Silver Fleet is greater still with these larger, faster, even more luxurious Douglas giants. * Cradled on 95-foot wings, completely soundproofed, steam heated and equipped with adjustable divan chairs for 21 passengers—these latest Douglas Transports are the world's most advanced method of transportation. Douglas Aircraft Company, Inc., Santa Monica, Calif.

WHEREVER YOU GO, TRAVEL VIA LUXURIOUS DOUGLAS EQUIPMENT

In **AMERICA**...on American Airlines, Inc. ... Eastern Airlines ... Pan American Airways ... T.W.A., Inc.... United Air Lines ... and Wilmington-Catalina Airline, Ltd.
In **THE ORIENT** ... on Japan Air Transport, China National Aviation Corporation, and K. N. I. L. M. in the Netherlands Indies.
In **SOUTH AMERICA**...on Pan American Grace Airways.
In **EUROPE**...OELAG in Austria; Deutsche Lufthansa in Germany; K.L.M. in the Netherlands; L.A.P.E. in Spain; LOT in Poland; C.L.S. in Czechoslovakia; Avio Linee Italiane in Italy; and Swissair in Switzerland.
In **AUSTRALIA** ... Holyman's Airways.

The World Standard Air Transport **DOUGLAS**

Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment

Fabric Rejuvenator

New Solution Gives New Life to Old Dope

OPERATORS SEEKING MAXIMUM SERVICE before recovering fabric covered surfaces have found Berryloid Fabric Rejuvenator, recently introduced by Berry Brothers, of considerable help. This product gives new life to old dope, seals cracks and breaks and tightens up flabby finishes according to word from the manufacturer.—AVIATION, *February, 1937.*

Exhaust Analyzers

Two Instruments For Exhaust Analysis Employ Different Principles

TWO NEW EXHAUST ANALYZERS, each of a distinctly different type, recently have been placed on the market.

The Permutit Company, of New York, announces the Ranarex which operates on a mechanical principle based on the knowledge that the specific weight of exhaust gases varies with changes in the air fuel ratio. This principle has been proved in practice by Ranarex CO_2 recorders in use in both stationary and marine steam power plants. The instrument works on the basis of comparison mechanically of the weight of air with the weight of the exhaust gases, through means of electric driven fans and impulse wheels linked through differential couplers to an indicator on which the scale is calibrated in terms of air-fuel ratio. The instrument is of rugged construction and is readily portable. It may be operated from the standard lighting circuit or, with a 6 volt DC motor, it will operate for a minimum of five hours on a single charging of a standard automobile type of storage battery.

Also of rugged construction, and readily portable, not even requiring an electrical connection, is the new Hays Orsatomat offered by The Hays Corporation, Michigan City, Indiana. The instrument is simple in operation, has no moving mechanical parts, and requires no skill on the part of the operator. Using a chemical principle, the Hays exhaust gas analyzer uses a sample of the gas to be analyzed by passing it through an absorbing chamber filled with caustic potash, which absorbs all of the carbon dioxide; the vacuum produced being used to operate a pointer indicating on a large scale which is calibrated in terms of CO_2 percentage. The manufacturers state that a sample of gas may be analyzed in twenty seconds by this method.—AVIATION, *February, 1937.*

TEL Tachometer with engine time register.

Neoprene

New Name for Synthetic Rubber by du Pont

FORMERLY SOLD by E. I. du Pont de Nemours & Company under the trade mark DuPrene, the synthetic rubber now widely used where resistance to the deteriorating effects of oil, gasoline, solvents, refrigerants, heat, sunlight and ozone are of importance, is being marketed under the generic term neoprene.

The new name neoprene is not trade marked and may be freely used by rubber manufacturers to describe products which embody the distinctive characteristics of this unique material.—AVIATION, *February, 1937.*

Tachometer

New Hasler TEL Tachometer Incorporates Automatic Engine Time Register

A NEW DUAL PURPOSE TACHOMETER of chronometric type is announced by R. W. Cramer & Company, Inc., 67 Irving Place, New York City, American distributors for the Swiss Hasler tachometers. Unique feature of the new instrument is the non-resettable register, automatically totalizing engine running time. The counter reads up to 999 hours 59 minutes and at 1,000 hours it starts from zero again.—AVIATION, *February, 1937.*

Ranarex Exhaust Gas Analyzer Made by Permutit.

UNITED AIR LINES'

new $3,000,000 fleet equipped with

MACWHYTE AIRCRAFT CABLE

One of the 28 new Douglas twin-engined transports built especially for United Air Lines' New York-Chicago-California route. All planes have the finest equipment, including Macwhyte Aircraft Cable for controls.

Macwhyte salutes this new standard in fast, comfortable air travel! We are proud of the part we have played in equipping this great new United Air fleet.

Macwhyte Aircraft Cable is precision made in our own plant on special aircraft cable machines. This modern equipment is used for making both PREformed and non-preformed cables. Manufacturing operations are under the close supervision of metallurgists and engineers. Tension, torsion, bending, fatigue and corrosion tests are constantly made in accordance with the latest A-N specifications in order to produce the most dependable, longest-wearing cable possible. *Write for Aircraft Cable Folder.*

Macwhyte Tie Rods

- *Streamline*
- *Square*
- *Round*

Made in accordance with A-N specifications to meet all tensile, bending and salt spray requirements.

AD NO. 259

Three Constructions

1 x 19 Non-Flexible	7 x 7 Flexible	7 x 19 Extra Flexible

MACWHYTE COMPANY

Kenosha, Wisconsin · Specialists in the manufacture of Cable, Tie Rods and Braided Wire Rope Slings for Aircraft

Operators' Corner

An exchange of ideas on the problems of the commercial aviation industry

QUESTION 20: Do you believe that a special license should be required for flying instructors? If so, what qualifications should be required? Should the number of hours needed be the same as that for the transport license or greater? Should some estimate of ability to impart knowledge be included in the requirements?

Need Special Rating

ALL INSTRUCTORS IN AVIATION should have special license, and the hours required should be greater than a transport as this work cannot be done right even by old transport pilots. It takes a man with a special make-up to do this kind of work, and he should be made to put in so many hours a year to hold this license or rating. Our future pilots depend on their first instructions and so does aviation.—W. H. WINCAPAW, *commercial pilot, Winthrop, Mass.*

Patience a Virtue

AN INSTRUCTOR MUST NOT ONLY BE A GOOD PILOT but he must quickly gain the full confidence of his pupil in every way. As in other professions, an experienced instructor never forgets that he also had to learn and that the only reason he has a student is that the student wants to be a pilot and is willing to pay for it. A hot headed instructor can ruin many good students and stop them from completing courses. Such a teacher can make a solo flight a thing to dread, while a patient instructor never has to worry about the future safety of the normal pupil. The Army Air Service during the war had to create a school of instructors. Experienced men could solo their students with safety in 5 hours while flyers with no experience would give dual for as long as 20 hours and then take a chance on the solo. A pilot with 200 hours should be able to instruct providing he has the right temperament and, if he has not, he will not get many students. There is no way that I see to check on the ability of an instructor to impart knowledge unless an instructor's school, as mentioned above, is available.—FRANK MILLS, *chief pilot, Essington School of Aviation and Seaplane Base, Essington, Pa.*

Too Fine a Point

WE DO NOT BELIEVE that a special license should be required for flying instructors. We think that such a requirement would decrease the possibility of expanding aviation activity throughout the country, which we now find progressing at an encouraging pace. In order to give flying instruction, a pilot should be able to pass two requirements, that is, first—he should have a transport license, and second—he should possess a certain personality and mental attitude that will enable him to do his work correctly.

The Department is now taking care of transport regulations. The second requirement is something that has to be worked out by itself in each locality. In the cases of established schools, the managements usually make certain that their instructors have that certain personality and mental attitude. In the cases of the individual operators, the question is usually settled by the customers themselves. A successful instructor produces successful students, therefore, if an instructor does not show good results, he will soon be eliminated by the simple process of not having enough business to enable him to continue operations.

We do not think it fair to strangle ourselves with a regulation that borders on so fine a point as the difference between good and perfect. The bad usually seem to eliminate themselves.—J. F. DONOVAN, *Manager, Associated Air Service, Ltd., Palo Alto, Cal.*

An Unwise Restriction

IN AN ORGANIZATION SUCH AS OURS there is bound to be a division of opinion on matters of aeronautical policy. It is the opinion of many in our company that we have sufficient laws and regulations at the present time to properly govern the industry. This also applies to the question of an instructor's license. Without doubt there are abuses in the use of transport licenses by instructors. However, any complications in this respect are a question of enforcement of existing laws and care in examining applicants for licenses.

The number of hours and the training required for a transport license should be sufficient to train an instructor. A pilot that is inherently inapt as an instructor will soon choose another line of work; if he is properly qualified as an instructor he should be able to teach students how to fly safely regardless of his aptitude for instruction.

It would seem unwise to saddle the industry with a multiplicity of regulations.—ARTHUR S. PEIRCE, *Taylor Aircraft Co., Bradford, Pa.*

Next Month's Question

QUESTION 21: Should a private pilot be allowed to carry and instruct students in licensed aircraft merely because he is not being paid? Have you had any experience with this problem? What is your solution?

How then do you interpret Paragraph E, Section 46, Bulletin 7, of the Air Commerce Bureau which states that a private pilot may not, for hire, instruct students?

(Submitted by H. E. Martin, Manager, Dennison Airport Operating Co., Atlantic, Mass.)

News of the Month

Highlighting recent events in the aviation world

***Domestic transport . . . I.C.C. considers off-line service for American . . . Last ten of American's DC-3's scheduled for delivery . . . Series of accidents claim 32 lives.**

***Awards and honors . . . W. A. Hamilton of TWA wins AVIATION'S annual maintenance award.**

***Research . . . N.A.C.A. annual report stresses need for expansion . . . Bendix forms new unit for radio research.**

***Foreign . . . Canada prepares to double air force.**

***Navy . . . Orders 40 Vought scout-bombers.**

***Industry . . . Lockheed expands . . . Taylor plans production of 2,500.**

Accident Series

Operators and federal units move to take corrective action as year-end toll of lives reaches 32

FOR A PERIOD OF A MONTH, from the middle of December until the middle of January, the gods of chance rained ill luck on air transport operators. In that brief period five U. S. airlines suffered accidents—four with attendant loss of life.

In six crashes there were 51 people involved. Of these 32 died (15 crew, 17 passengers), seven were injured (3 crew, 4 passengers), and twelve were unhurt (3 crew and 9 passengers).

First mishap was to a Western Air Express liner, which disappeared with seven aboard on a flight between Los Angeles and Salt Lake.

Three days later, Dec. 18, a Northwest Airlines Lockheed Electra, flying between St. Paul and Seattle, reported its position at 4:19 A.M. as 80 miles west of Elk River, Ida. That was the last that was heard from the ship. Aboard were Pilot Joe Livermore, Co-pilot A. A. Haid, but no passengers.

Dec. 21 the wreckage was sighted from the air on a ridge 15 miles south of Kellogg, Ida.

The next crash in the series had no serious consequences except the loss of a ship. On Dec. 19 an Eastern Air Lines Douglas, Northbound to New York from Miami, ran into heavy weather at Camden, N. J., finally wound up on a ridge northwest of Port Jervis, N. Y., 60 miles west of its goal. Pilot Henry T. (Dick) Merrill had brought the ship in through an eighth of a mile of trees, removing both wings and motors, but leaving fuselage and passengers almost intact.

A crash on Dec. 23 cost the lives of six Braniff Airways employees, including Donald C. Walbridge, operations manager, and Sterling Perry, superintendent of maintenance. One of Braniff's Lockheed Electras was undergoing a test flight following installation of an overhauled right engine at Love Field, the Dallas Municipal Airport; the ship crashed after failure of that engine.

The next two accidents capped the climax. Both occurred in the mountainous region north of Union Air Terminal, Burbank, Cal. Dec. 27 a United Air Lines Boeing enroute to Los Angeles from San Francisco, carrying nine passengers and crew of three, struck a ridge near Saugus,

MAINTENANCEMAN HAMILTON
of TWA won AVIATION'S annual maintenance award this year.

only twenty miles from the Burbank terminal. Next day all twelve aboard were found dead in the battered fuselage. The crash occurred during a violent storm which was sweeping the whole western seaboard. It was the first fatal accident suffered by United in seven years of operation on the Los Angeles-San Francisco run.

On January 12 Western Air Express suffered its second crash within a month, after a record of ten years without fatality. The scene was a few miles south of the spot where the United crash had occurred. Of the thirteen persons on board, one was killed outright and four more, among them Martin Johnson, the explorer, and co-pilot Clifford P. Owens, later died. The other eight received various minor injuries or were entirely unhurt.

But the appalling succession of accidents turned many a traffic manager's hair gray, and set up an insistent questioning as to the cause, not only from airline operators and government bureaus, but from an alarmed public as well. Every cause from failure of the Department of Commerce radio facilities to interline jealousy among pilots to complete schedules has been put forward.

Following the Eastern Air Lines mishap, E.A.L.'s general manager, Captain E. V. Rickenbacker, wrote a letter to Assistant Secretary of Commerce J. Monroe Johnson, suggesting four improvements that should be made in Department of Commerce and airline radio equipment. "In my opinion, such aids as recommended above, in conjunction with those now in use, will eliminate 75 per cent of the possibility of such accidents as occurred to Dick Merrill of Eastern Air Lines," said Captain Rickenbacker.

Colonel Johnson, in reply, admitted general accord with Rickenbacker's suggestions and urged "constant effort" on the part of the airline operators to improve their own radio equipment, install de-icing equipment, and thoroughly indoctrinate flying personnel in blind flying methods, recommending courses on the Link trainer. He also promised continued effort on the part of the Commerce Department to secure from Congress the necessary funds for improving its navigation facilities. He announced that a conference between airline operators and officials of government departments having a hand in aircraft operation would be called in the very near future.

Jan. 12, as pure coincidence, came an announcement from the Department of Agriculture to the effect that 100 new off-the-airway weather reporting bases had been set up. They will report six-hourly observations to Oakland or Chicago where they will be relayed over the entire airway weather system. Twenty other stations have been re-equipped for more intensive service.

From some quarters came the complaint that the airlines' trouble was the result of faulty reception of the Commerce Department's radio beams, due to weather conditions which set up rain or snow static in the receiving antenna.

To overcome static interference with reception TWA has recently installed in all its ships a radio direction finder, centering about an anti-storm-static loop antenna, developed by TWA engineers. After an observation flight over the system, Eugene L. Vidal, Bureau of Air Commerce Director, wired TWA president Frye: "From all our reports it appears that TWA has not only successfully eliminated snow and rain static from radio reception. . . .but is operating satisfactorily a new direction finder and homing device." Operation of the device depends on the familiar directional characteristic of a loop antenna.

American Airlines is moving to meet the difficulties of beam navigation by supplementing navigation equipment with the new radio compasses developed by Bendix.

To insure proper operation of Federal aids, Chairman Royal S. Copeland of the Senate Commerce Committee said his Air Safety Subcommittee would recommend to Congress appropriation of $10,000,000 to improve weather reporting and radio facilities still further.

A bill has been introduced in the Senate by Nevada's Senator Pat McCarran which would place air traffic regulation under the I.C.C., instead of the Bureau of Air Commerce as at present.

Aviation's Award

Hamilton of TWA recognized for maintenance achievement

WALTER A. HAMILTON, system maintenance superintendent for TWA, and for the last three years chairman of the A.C. of C. and the A.T.A. Maintenance Committee, was selected as the recipient of AVIATION's Maintenance Award for 1937. Presentation of the bronze plaque and certificate was made by Col. Frederick L. Martin at a dinner held late in January at the Hotel Van Cleve at Dayton, Ohio.

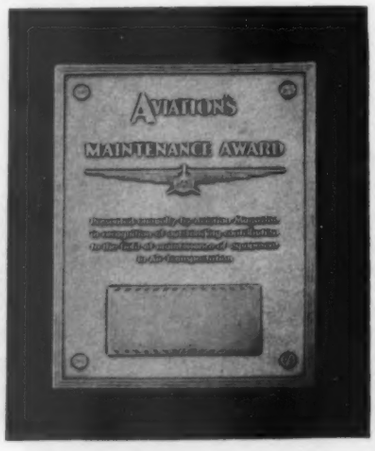
Hamilton has been active in the field of aircraft maintenance for many years. Under his guidance TWA's great overhaul and servicing plant at Kansas City has been built up and operated on such a high level of efficiency that it has become a standard of comparison for maintenance depots all over the world.

The meeting at which the award was made was one of the regular semi-annual inter-line conferences held, by invitation of the Army Air Corps, at Wright Field. Representatives of the Army and the Navy and other governmental services met with the Maintenance Committee to discuss common problems. At the end of the sessions Oliver West of United Air Lines was elected committee chairman for the coming year, replacing Walter Hamilton. The committee elected C. S. I. Irvine, Assistant Chief, Engineering Section, Wright Field, as its second honorary member.

N. A. C. A. Report

Urges expansion of American research facilities

CALLING ATTENTION to recent intensification of basic research efforts on the part of European nations, the National Advisory Committee for Aeronautics, in its annual report to the President, urges "the wisdom and ultimate economy of its policy



THE ANNUAL AWARD

"In recognition of outstanding contribution to the field of maintenance."

(of expanding its own research facilities) as the best insurance against falling behind in the development of an instrumentality so vital to national defense and so effective in the promotion of commerce and in the advance of civilization."

The report points out that within the past year its new 500-mile-an-hour wind tunnel, which has more than met its designed performance, has been put into service. The 2,000-ft. towing tank for the study of hydronamic characteristics of floats and hulls is being increased to a length of 2,900 ft., which will permit water speeds up to 80 m.p.h.

Transport Service

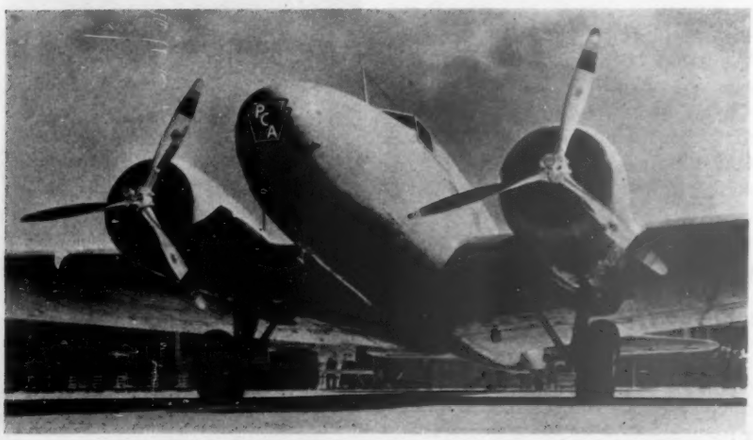
American petitions ICC for off-line routes.
PCA buys 10 Boeings

THE ICC HAS overruled a motion by the solicitor for the Post-office Department that the Commission dismiss American Airlines' petition for establishment of off-line service between Detroit and Indianapolis for want of jurisdiction. American has also applied for permission to establish service between Detroit and Cincinnati. Both Eastern Air Lines and Pennsylvania-Central Airlines have applied to the Commission for permission to intervene. Eastern's request is the only one that has been granted at the time of writing.

American Flagships—The final ten of American Airlines' 30 Douglas DC-3's are scheduled for delivery beginning the last two weeks of this month. Already in service are eight 14-passenger sleepers and twelve 21-passenger day planes. All the sleepers are being equipped with the new Bendix radio homing compasses.

PCA expands—Ten Boeing 247-D transports have been purchased from United Air Lines by Pennsylvania-Central Airlines. They will replace Stinson A's and Boeing 247's formerly used by Central Airlines and Pennsylvania Airlines. PCA's new maintenance base and operations headquarters will be located on Pittsburgh's Allegheny County Airport. Starting about January 15, Flint, Mich., was scheduled as one of the major stops on the Pittsburgh-Detroit-Milwaukee route of this progressive company.

WAE DC-3's—Western Air Express has ordered two 14-passenger Douglas DC-3 sleeper planes, at a cost of about $250,000. Schedules will continue to tie in with United's at Salt Lake City, offering identical equipment for service from southern California to Salt Lake, thence to the east coast by way of United's mid-continent route.



PENNSYLVANIA-CENTRAL
has just purchased ten of these Boeing 247-D's from United Air Lines for use on the Washington-Milwaukee route.

Radio Research

Bendix Aviation forms new radio unit for extensive research

THE BENDIX AVIATION CORPORATION has consolidated four radio and aviation equipment companies into a new unit to be known as the Bendix Radio Corporation. The new organization will specialize in radio equipment for communications and navigational purposes for the aircraft industry, with particular attention to blind flying and safety in landing under adverse weather conditions. Vincent Bendix will be president and other executives will be drawn from the four companies making up the new unit.

Included in this group is L. A. Hyland, of the Radio Research Company, vice president and general manager; Roy T. Hurley and W. P. Hilliard, vice presidents; C. E. Mead, vice president and works manager; Walter J. Buettner, treasurer; Henry Gossner, secretary and W. H. Houghton, controller.

The companies which form the new Bendix affiliate are the Radio Research Company, Inc. of Washington, D. C., the Radio Products Co. of Dayton, Ohio, the W. P. Hilliard Co. and Jenkins & Adair.

The new company will have plants and laboratories in Chicago, Dayton, Washington and Oakland, Calif., and will be staffed with more than 100 engineers and technicians.

One of the major benefits to be derived from such large-scale research facilities, according to Mr. Bendix, will be availability of the resources and manufacturing experience of the parent corporation. He also hinted reduction of the cost of radio equipment for the private plane operator.

Navy Voughts

40 scout-bombers of SBU-1 type ordered for fleet service

ONLY MILITARY ORDER OF THE MONTH came from the Navy and went to Chance Vought Aircraft Division of United Aircraft Corporation. It is for 40 scout-bombers, basically similar to the SBU-1, of which 84 were delivered last year.

The plane is a two-seat biplane of metal structure, fabric covered. Power is derived from a 700-hp., 14-cylinder Pratt & Whitney Twin Wasp Jr. engine, delivered through

MARTIN B—10—B BOMBERS
(Model 139—W)
Incorporated in these Martin Bombers are recent refinements in aerodynamic detail and the latest facilities for offense and defense. Superior performance, increased reliability and greater striking power are the result. The improved Martin Bombers are now available for early delivery.
THE GLENN L. MARTIN COMPANY
BALTIMORE, MARYLAND
Builders of dependable aircraft since 1909

The extent to which manufacturers depend upon the Nickel Alloy Steels to give long life and reliability to aircraft engines is testified to by the fact that some of these engines contain as many as fifty Nickel Steel parts...Their superior toughness and strength, together with their high resistance to fatigue and stress, make the Nickel Alloy Steels the standard materials for highly stressed engine applications in the aircraft of every country.

NICKEL ALLOY STEELS

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N.Y.

a Hamilton Standard controllable pitch propeller.

Specifications and performance figures for the SBU-1, which have heretofore been withheld, are as follows: span, 33 ft. 3 in.; length, 21 ft. 9½ in.; gross weight 5,318 lb.; top speed, 205 m.p.h. at 8,900 ft.; landing speed 65 m.p.h.; service ceiling 24,600 ft.

Canada's Air Force

1937 estimates call for doubling man power

AS A FIRST STEP toward a declared policy of cooperative Empire defense, Canada in January announced a policy of greatly increasing her military strength in the air. Estimates which were submitted to the Dominion's House of Commons on Jan. 18 called for an increase of over 100 per cent for the Royal Canadian Air Force, providing for extensions in every branch of the service.

Total defense estimates call for an expenditure of $34,999,000, of which $11,381,000 is for the R.C.A.F. This compares with only $4,685,000 in 1936.

Personnel of the permanent air force will be increased from 147 officers and 933 airmen to 198 officers and 1,498 airmen. With similar increases in the non-permanent force, total strength will be 331 officers and 2,444 airmen.

Hughes Record

Twin Wasp Jr.-powered racer flies L.A.-N.Y. in 7 hr. 28 min.

EVEN AERONAUTICAL PEOPLE were amazed when Howard Hughes slammed his Cyclone-powered Northrop Gamma from Los Angeles to New York in nine hours and a half a year ago. Last month, almost exactly a year later, they were even more amazed when the serious young movie producer broke his own record by two hours. This time he flew the 2,490 miles non-stop in the incredible time of 7 hours 28 minutes 25 seconds, to maintain an average speed of 332 miles an hour.

This time he flew the racer of his own design with which he set the present world landplane speed record of 352 miles an hour in September, 1935. It is powered with a Pratt & Whitney Twin Wasp, Jr., delivering 1,100 hp.

Over Winslow, Ariz. the apparatus governing the flow of oxygen to his face mask failed to function properly and he found himself feeling distressed. He nosed down to 15,000 ft., yelling to relieve the pressure in his ears, and was soon feeling all right again. He had intended stopping at Chicago, but weather was so good, and fuel consumption so low that he decided to come on to Newark non-stop, crossing the finish line at 12:42:25 p.m.

Calendar

Jan. 28–Feb. 6—National Aircraft Show, Grand Central Palace, New York.

March 13–21—Second Annual Pacific Aircraft Show, Pan-Pacific Auditorium, Los Angeles, Cal.

June 26–July 10—Eighth Annual Soaring Meet (International), Elmira, N. Y.

July 23–Aug. 1—Fourth International Aviation Meeting, Zurich, Switzerland.

Oct. 12–28—Second International Aeronautical Salon, Milan, Italy.

Industry Notes

Several factories expand. Taylor expects to produce 2,500

AERO ENGINEERING CORPORATION has moved its manufacturing facilities from Long Beach, Cal., to Metropolitan Airport, Van Nuys. A new company is being formed which will acquire a 20-acre tract and a number of buildings which will provide about 50,000 sq.ft. of floor space.

Present plans call for production of 25 Aeroneers. The company is negotiating for the granting of manufacturing licenses in Great Britain and Canada.

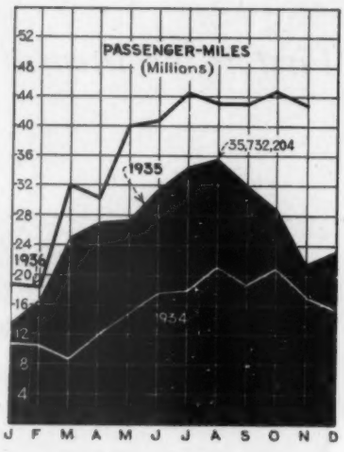
Lockheed expansion—After leasing its present factory and site at Burbank, Cal., for more than four years, Lockheed Aircraft Corporation has announced their purchase together with several acres of adjacent property, at a cost of $165,000. To meet the demand created by a $2,250,000 order backlog—400 per cent greater than a year ago—an extensive expansion program is in progress.

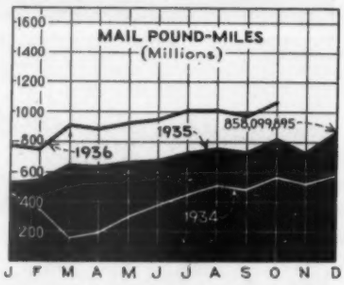
2,500 Cubs—which is the number the Taylor Aircraft Company of Bradford, Pa., expects to manufacture and sell during 1937. 1936 showed a 160 per cent increase over the year before, a total of 550 Cubs having been turned out.

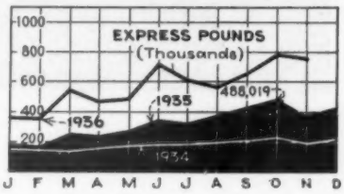
Fleet reorganization—Fleet Aircraft of Canada, Ltd., has been reorganized under Canadian law as Fleet Aircraft, Ltd. Authorized stock

Traffic

Latest available statistics from the Bureau of Air Commerce and the Post Office Department—Domestic airlines only







AIR TRANSPORT INDICATOR

Jan. 1, 1937

117

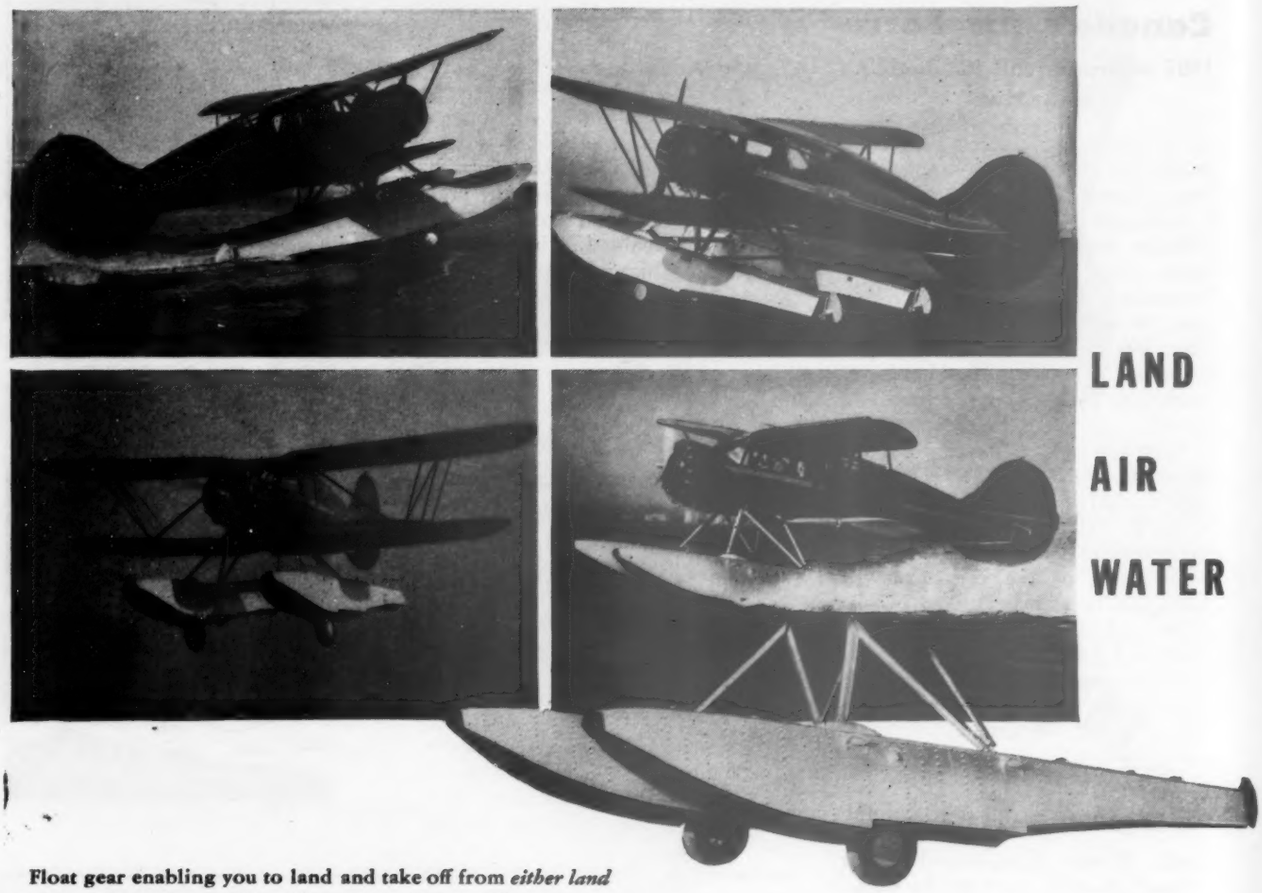
—which is the ratio of revenue passenger miles for December 1936 as compared with the corresponding figure for 1935. 1935.

For November 1936 the indicator stood at 229.7.

LONG AWAITED—NOW AVAILABLE

EDO AMPHIBIOUS FLOAT GEAR

First to be licensed by the U. S. Bureau of Air Commerce



Float gear enabling you to land and take off from *either land or water!* Interchangeable with regular wheel landing gear so that your plane need be amphibian equipped only when required. These invaluable features long sought by plane owners are now offered by Edo's Amphibious Floats—wholly new in design—tested in efficiency.

Six years of research and testing have gone into the Edo Amphibious Float gear, the first to be licensed by the U. S. Bureau of Air Commerce. Wheels, sprung by Bendix shock struts, retract wholly within the floats, with the aperture shielded from water action by a secondary step. Efficient brakes are provided. Tail loads are carried by oleo shock struts built into a hinged rear section of the floats which are curved downward, armored with Stellite, and transformed by rollers into a combination tail wheel and skid. Manoeuverability on the water through the uncompromised use of Edo retractible water rudders is in this way assured even at low taxiing speeds.

Edo Amphibious Floats offer both economy and selectivity because with them your favorite ship can now be purchased as an amphibian. Fitted with this gear, a plane retains the well known seaplane advantages of easy handling—quick float replaceability in case of damage—pilot vision and passenger comfort, isolated from waves and spray—safety due to built in water-tight compartments. Yet, when desirable to change back to straight wheel gear the plane needs no seaplane ramp facilities—it can be landed at your home airport and the change-over made in a few hours time.

Edo Amphibious Float gear will be available this year on ships in the 4-5 place class. You are invited to communicate with the manufacturer or distributor of your favorite plane for full information regarding his product so equipped.

EDO AIRCRAFT CORPORATION

600 Second Street, College Point, L. I., N. Y.

was increased from 10,000 shares to 100,000 shares, which will give the company a capitalization of $1,000,000. Fleet was originally a Consolidated Aircraft Corporation subsidiary; as reorganized, it will be entirely controlled and primarily owned by Canadian interests.

Officers of the new company are: W. J. Sanderson, president and general manager; E. G. McMillan, vice-president; and H. E. Langford, secretary and treasurer.

Insurance engineers—Aero Insurance Underwriters have announced a considerable expansion of their engineering department, which was established in 1924. The expansion is to provide facilities for periodic inspection of all risks insured by the company. The engineering department is headed by Jerome Lederer, who is also secretary of the Aeronautical Division of the National Safety Council.

Propeller absorption — Announcement that the Supreme Propeller Company, Wichita, Kan., has been absorbed by Barkley-Grow Aircraft Corporation, Detroit, Mich., is made by Commander H. B. Grow, president of the latter firm. Tests are now being conducted on a preliminary production group of Supreme propellers, some of which are scheduled for display at the New York Show. Quantity production of propellers in the low power range is planned for early February. The company is also building a twin-engined transport plane for feeder line and general purpose use.

Martin changes—Glenn L. Martin, president and chairman of the board of the company which built the Pan American Clipper ships, has announced plans for doubling the size of his plant at Middle River, near Baltimore. The program calls for expenditure of $2,000,000, of which $600,000 will go for new machinery. Construction plans call for an assembly building 300 ft. wide by 500 ft. long, with a minimum height of 40 ft. Mr. Martin says "it will constitute the largest unobstructed airplane factory space in the world."

Transport Abroad

"C" boats improve Imperial service. K.N.I.L.M. extension

WITH THE THIRD of the Empire flying boats, "Castor," in service, Imperial Airways of Great Britain on Jan. 4 eliminated the train link between Marseille, France and Brindisi, Italy. This reduces to one night, between Paris and Marseille, the time passengers must spend on trains. From Brindisi the route is across the Mediterranean to Alexandria.

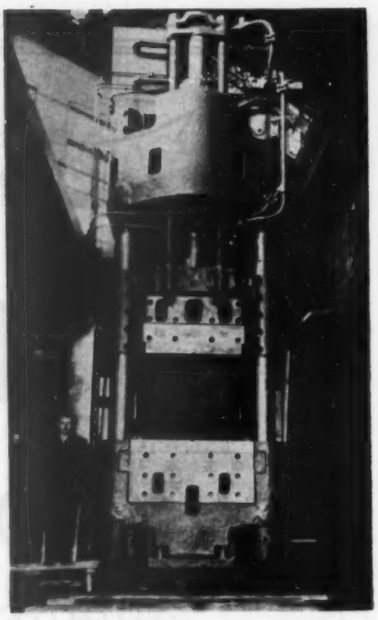
Borneo extension—K.N.I.L.M., the Royal Netherlands Indies' Airways, extended their Java-Borneo line, between Batavia and Balikpapan, 350 miles to Tarakan on Borneo's east coast. The line now stands ready to extend operation from Batavia to Manila as soon as Philippine authority is granted. The Batavia-Tarakan service is weekly and is maintained with Douglas DC-2's.

Financial

Record sales, bonuses, dividends show encouraging upswing

THE FOURTH QUARTER of Douglas Aircraft's fiscal year, ended Nov. 30, showed net sales of $4,317,000, against a total of $3,631,000 for the preceding nine months. The $7,948,000 net sales for the year were the highest in the company's history. Unfilled orders as of Nov. 30 reached a new high of $24,526,000, compared with $12,000,000 for 1935.

A Christmas bonus for 1,100 North American Aviation employees who earned less than $3,600 a year was announced by President J. H. Kindelberger. Employees with a year or more service received $35 to $50.

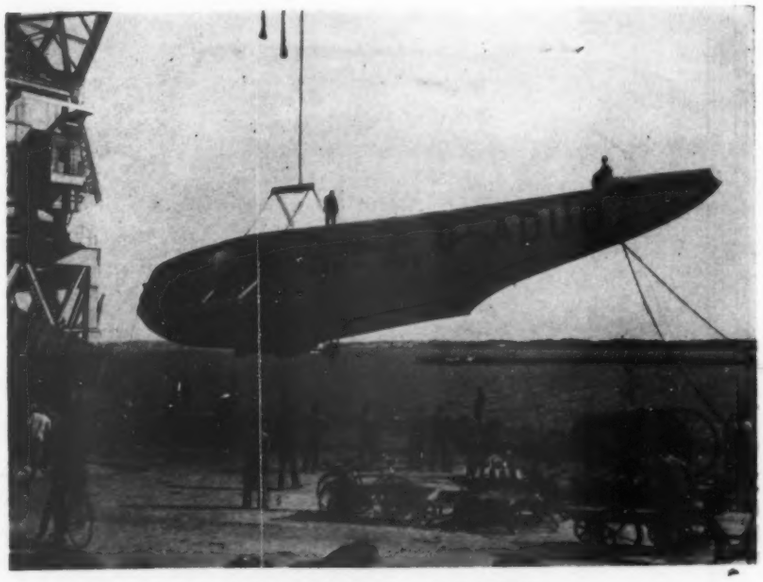


A PRESSING PROBLEM

at the Lockheed plant prompted installation of this 175-ton metal forming press.

Western Air Express directors have declared a 25 cents a share dividend on capital stock. It was payable last Dec. 23 to stockholders of record Dec. 12. The last previous payment by W.A.E. was 15 cents a share in 1931.

TWA paid a special dividend of 25 cents a share on Dec. 21.



"CAVALIER" ARRIVES

at Bermuda, where she will shortly start New York-Bermuda service. She is one of Imperial Airways' Empire flying boats.

1932 1933 1934 1935 1936 1937

BREWSTER'S BIRTHDAY

IN THE FIFTH anniversary of the founding of this corporation, the officers and employees wish to express their sincere appreciation to those client companies whose valued trade has made Brewster's success possible:

Air Cruisers, Incorporated
Aviation Manufacturing Corporation
Vultee Aircraft Division
Bellanca Aircraft Corporation
Breeze Corporations, Incorporated
Consolidated Aircraft Corporation
Curtiss-Wright Corporation
Curtiss Aeroplane Division
Wright Aeronautical Corporation
Douglas Aircraft Company, Incorporated
Eastern Air Lines
Edo Aircraft Corporation
Fairchild Aviation Corporation
Fairchild Aircraft Corporation
Fairchild Aerial Camera Corporation
Fleetwings, Incorporated
Fleet Aircraft of Canada, Limited
Grumman Aircraft Engineering Corporation
Hall-Aluminum Aircraft Corporation
St. Regis Paper Company, Incorporated
Seversky Aircraft Corporation
Sperry Gyroscope Company, Incorporated
Standard Oil Company of New Jersey
Switlik Parachute and Equipment Company
United Aircraft Manufacturing Corporation
Sikorsky Division
Chance Vought Division
United Fruit Company
United States Navy
United States Coast Guard

For the years to come we pledge ourselves to a strict adherance to the quality of products with which the name of Brewster has been identified for more than a hundred years.*

BREWSTER AERONAUTICAL CORPORATION

Designers and Manufacturers of Aircraft Parts

LONG ISLAND CITY NEW YORK

*BREWSTER & CO., Carriage Builders, founded 1810

Schools, Services, and Airports

A state-by-state tour of the flying fields

» **ALABAMA**—Steadham Acker, manager of the BIRMINGHAM Municipal Airport, has been elected governor for Alabama of the National Aeronautic Association for 1937, according to announcement by Hayden Brooks, retiring president. Later the NAA announced that Mr. Acker had been appointed official air meet director for ALABAMA, TENNESSEE, MISSISSIPPI and LOUISIANA.

» **ARIZONA**—Frank H. Robertson has established a fixed-base flying service at PHOENIX Sky Harbor, offering student instruction, sightseeing rides, and charter flights. The Phoenix City Council has contributed $10,000 to secure a $100,000 fund from the WPA to oil the field, which is quite dusty when dry.

» **CALIFORNIA**—Members of the Los ANGELES Aviation Country Club have selected SAN DIEGO as the goal for their first air tour of 1937, which was scheduled for Jan. 23 and 24. . . . W. F. Harbaugh, SACRAMENTO, was expecting to take delivery on his new Porterfield late in January. The ship was sold through Dale Hunter, who bases at Sacramento Municipal Airport, by Bob Kashower, Porterfield's West Coast Sales Manager.

» **CONNECTICUT**—John H. Tweed, manager of the NEW HAVEN Municipal Airport, has reported that 1936 was the busiest year the airport has ever seen. Total of visiting aircraft reached 1,706, 143 more than in 1935.

» **FLORIDA**—More than 10,000 spectators witnessed the airshow dedicating Morrison Field, WEST PALM BEACH's new $175,000 municipal airport.

» **ILLINOIS**—Joseph H. Seyller has been named president of the Aeronca Flying Club, PEORIA, replacing Jack Weaver. Other officers are: Carl Willi, vice-president, and Dr. Lloyd K. Wyatt, secretary-treasurer.

» **INDIANA**—Newly elected officers of the SOUTH BEND Flying Club for 1937 are: Harry S. Wagner, president; Fred T. Wharton, vice-president; Marjorie Stables, secretary; Louis Taylor, treasurer; George Fetters, sergeant-at-arms.

» **KANSAS**—A new Taylor Cub has been purchased by the Fowler Flying Service of DODGE CITY. It was purchased from the Harte Flying Service, of WICHITA.

» **MAINE**—Northeast Airways, Inc., basing at PORTLAND City Airport, has been named dealer for Taylor Cubs. The company also conducts a flying school. Late in December a $10,000 lighting system was inaugurated at the Portland City Airport.

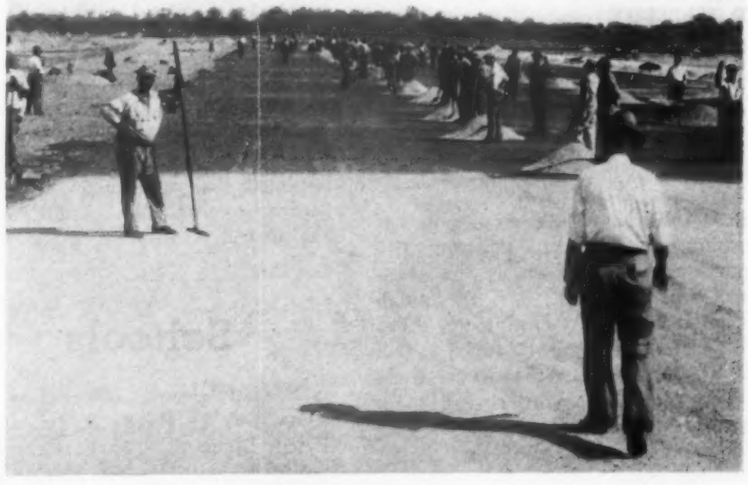
» **MARYLAND**—Fred E. Ennis has purchased a 190 acre tract a mile and a half from SALISBURY, where he has been operating an airport. He plans to open a charter service, and erect a ten-plane hangar.

» **MASSACHUSETTS**—Charles Hamilton, manager of the Bayside Flying Service, HINGHAM, has purchased a new Taylor Cub to assist in operations.

» **MICHIGAN**—The BATTLE CREEK City Commission has appointed Keith Moon manager of Kellogg Airport. . . . L. D. Honeywell, Gordon Kilmer, Ken Aucompaugh, and Russell Bishop have formed the Bishop Flying Service, Inc., which will operate a charter and taxi service at Bishop Airport, FLINT.

» **MONTANA**—The new administration building at the HELENA Airport was occupied recently.

» **NEW HAMPSHIRE**—The city of CONCORD has leased the Concord



NEW RUNWAYS
are laid on the Savannah, Ga., municipal airport

Airport for 25 years, with option to renew, paying a rental of $1 a year to the State.

» **NEW YORK**—Ten charter members have formed the American Flying Club at MASPETH. The club has purchased a Taylor Cub for flying instruction. Charles Wellstead is chief instructor.

» **OHIO**—New 4,000 ft. runways will be constructed at TOLEDO'S newly acquired municipal field, Transcontinental Airport. . . . DAYTON'S new municipal airport at VANDALIA was dedicated Dec. 17, aviation's 33rd birthday. On that day TWA started regular schedules through Dayton.

» **OKLAHOMA**—Sale of gasoline and oil at the OKLAHOMA CITY Municipal Airport has shown a substantial increase over the budget estimate, according to a report of Manager William Bleakley.

» **OREGON**—E. F. Kiso, SEATTLE, has purchased a new Taylor Cub on floats. . . . Portland Air Service, operating at Swan Island, PORTLAND, has been purchased by the S. & M. Flying Service, owned by Tracy Shute and L. C. Moore.

» **PENNSYLVANIA**—Donald Nelson has opened a charter service at the Pipher Airport, EAST STROUDSBERG, where he will have three planes. He will also maintain a repair shop. . . . Robert C. Helfrich and Winfred M. Post, Jr., have leased the ALLENTOWN-BETHLEHEM Airport, which they will operate. Both are graduates of Parks Air College.

» **TENNESSEE**—Stanley Frame, chief pilot, and Webb Kimble will operate Air Service & Sales at CHATTANOOGA Airport in the absence of Carl Wooten, who has taken a position as sales manager of Taylorcraft Aviation Co., Alliance, O.

» **TEXAS**—N. A. Meyers is now operating the GRAND PRAIRIE airport, which is known as the DALLAS-FORT WORTH Air Terminal. Burrell Tibbs is operating the Tibbs Flying School at the field. . . . Manager William Fuller of the FORT WORTH Municipal Airport has reported that 11,000 planes carrying 75,000 passengers used the airport during 1936.

» **UTAH**—Frank J. Fulmer has been named superintendent of construction for the project to enlarge the SALT LAKE CITY Municipal Airport administration building. . . . The SALT LAKE Chamber of Commerce is seeking installation of night lighting facilities on the GREAT FALLS-HELENA portion of the National Parks Airways route.

» **VERMONT**—Manager Harold W. Pugh has reported that 1936 was the busiest in the history of BURLINGTON Airport. A total of 336 planes registered at the airport, exclusive of the regular daily service of Boston-Maine-Central Vermont Airways. Regular pilots at the airport carried 1,293 passengers and made 153 charter trips in the year.

» **VIRGINIA**—The State Corporation Commission has issued a license to the ENDLESS CAVERNS Airport, scene of the establishment of a number of world speed and altitude records. . . . The ROANOKE City Council has voted to take over operation of the Roanoke Municipal Airport, operated since 1930 by Clayton Lemon and Frank Reynolds.

» **WASHINGTON**—ASOTIN COUNTY and CLARKSTON officials are seeking WPA funds for construction of an airport at Clarkston, to serve both that city and LEWISTON. . . . The State PWA administration has promised cooperation with SEATTLE city officials for the establishment of a seaplane base on Lake Washington.

» **WEST VIRGINIA**—MORGANTOWN is seeking an additional WPA allotment of $219,000 for completion of an extensive improvement project at the Morgantown Municipal Airport.

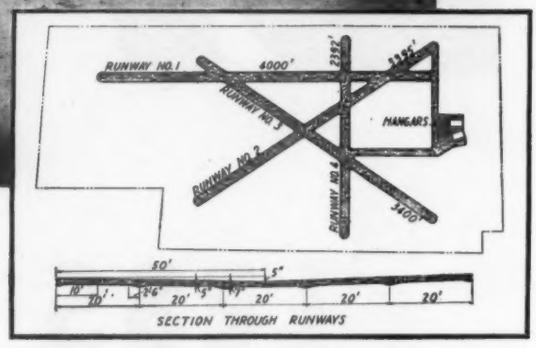
» **WISCONSIN**—MADISON aldermen have voted to accept a $74,000 WPA fund for construction of runways on a new municipal airport. It is expected that additional funds will be forthcoming later. Total cost of the project is estimated at $355,000.

Schools

» Recently-elected officers of the Aero Club of PARKS AIR COLLEGE, E. St. Louis (Ill.), are: Paul Taylor, president; Walter Hyatt, vice-president; J. Bud Dunleavy, treasurer, and Charles J. Hirst, secretary. Of the 65 men who were graduated from PARKS in the last three terms, every one was placed in a job before he was actually graduated.

» Theodore A. Woolsey has started a school in Los Angeles, known as the AERONAUTICAL INSTITUTE OF LOS ANGELES, which specializes in the conversion of mechanical engineers into aeronautical engineers. The school also operates a ten-week course for instruction of airplane mechanics which qualifies for the sheet metal work so much in demand at the present time. . . . THE AIRCRAFT RADIO AND INSTRUMENT TRAINING Co. has been set up at Roosevelt Field, Mineola (N. Y.) to give advanced training in instrument flying. The course includes fifteen hours instruction on the Link Trainer, and qualifies students for the Bureau of Air Commerce's Non-Scheduled Instrument Rating test. . . .The New York State Education Department has, under the direction of EARL R. SOUTHEE, set up aviation ground schools in Buffalo, Elmira, and Utica. Schools are under the direction of Lewis A. Wilson and Jack Wright. More than 100 students are enrolled. . . . The School of Adult Education of the General Extension Division of the University of Florida, assisted by the Aviation Division of the State Road Department and the Education Division of the Florida WPA is offering a twelve weeks' aeronautical course at CAMP ROOSEVELT (Fla.). . . . PORTLAND AIR SERVICE, one of the oldest flying schools in Portland (Ore.) and conducted by Lester Meadows, has sold out to Shute & Moore. . . . The OKLAHOMA SCHOOL OF AERONAUTICS, Oklahoma City (Okla.) was scheduled to start classes Jan. 12, with Lieut. John E. Cook as chief instructor. . . . The ROBERTSON AVIATION SCHOOL, located on the Lambert-St. Louis Municipal Airport, St. Louis (Mo.) has announced the opening of night classes in airplane and engine mechanics. Total enrollment is 72, comprising 33 night students, 28 day mechanics students, and 11 flight students. Five new instructors, Harold W. Law, Fred W. Brown, Louis Seigfried, Ed Wagner and Joe A. Wright, have been added to the teaching staff. . . . Chief Pilot JAY SODOWSKY and Wayde Stewart of the Parkersburg (W. Va.) Municipal Airport soloed twenty-one students during 1936.

Giving a concrete runway the smooth riding surface and non-skid texture so essential to safe landing. Dayton, Ohio, airport. F. O. Eichelberger, city manager; George F. Baker, director of service and buildings; H. J. Derivan, district director of WPA.



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Aviation People

Who's who and what they are doing

George N. Armsby

William Littlewood

Charles A. Reinstrom

Milton Van Slyck

Max J. Pollet

» For many years a member of the board of directors and executive committee of Curtiss-Wright Corporation, GEORGE N. ARMSBY was recently elected to chairmanship of the board. Curtiss-Wright Corporation is the parent company of Wright Aeronautical Corporation and controls the divisions of the Curtiss Aeroplane Company.

» Only change as the result of the recent elections of the Air Transport Association of America is its vice-president, CROIL HUNTER, manager of Northwest Airlines, succeeding W. A. PATTERSON of United Airlines. Re-elected were COL. EDGAR S. GORRELL, president; FOWLER W. BARKER, secretary-treasurer; and W. A. PATTERSON, CROIL HUNTER, C. R. SMITH, T. E. BRANIFF, PAUL COLLINS, and JACK FRYE as directors.

» Shobe Airlines of Boston will carry on much as before the death of JOHN H. SHOBE, save that CHARLES S. COWAN replaces him as president, general manager, and chief pilot. Cowan comes from Rhode Island State Airport where for the past four years he has acted as general manager and chief pilot. JOSEPH GARSIDE, for some years with E. H. Wiggins Airways, will be treasurer, with DANIEL DUGGAN and RALPH EAMES continuing as pilots.

» On Jan. 3 death claimed EDWARD C. HUFFAKER, 80, aviation pioneer. In the early days Mr. Huffaker worked with the Wright brothers and with SAMUEL P. LANGLEY in designing their first ships.

» Seversky Aircraft Company of Farmingdale has placed F. WILLIAM ZELCER in its newly created office of vice president, his prior post having been executive assistant to the president. Mr. Zelcer was formerly Assistant Commissioner of Docks in charge of Aviation for the City of New York, in which capacity he managed Floyd Bennett Airport and supervised construction of the seaplane ramps in New York City.

» The Farquhar Company, in expanding its hydraulic press division, has placed D. J. GREGORY in charge as chief engineer.

» Two members of the staff of American Airlines have moved up to vice-presidencies. WILLIAM LITTLEWOOD, since 1930 chief engineer, becomes vice-president in charge of engineering. Before joining American, Mr. Littlewood had been connected with Niles-Bement-Pond, Ingersoll Rand, Fairchild-Caminez Engine Corporation, and Fairchild Engine Corporation. Year ago his paper on "Operating Requirements for Transport Airplanes" won him the S.A.E. Wright Medal. . . . Other promotion is CHARLES A. REINSTROM as vice-president and general sales manager. Mr. Reinstrom has been concerned with traffic sales since 1928, first with Transamerican Airlines, later with its successor, American Airlines. His headquarters are in Chicago.

» MILTON VAN SLYCK, newly appointed assistant to president JACK FRYE of Transcontinental & Western Air, joined the line ten months ago as public relations manager for the central region. Previously he had been transportation editor for the Chicago Journal of Commerce. His office is in Washington, D. C.

» DONALD DELACKNER, chief engineer of Federal Aircraft Corporation, has resigned to become vice-president of Yankee Aircraft Corporation. Mr. DeLackner was long associated with the late Z. D. GRANVILLE in the design of the record-breaking Gee Bee racers. After the death of Mr. Granville, the firm was reorganized as Granville, Miller & DeLackner, consulting engineers.

» New officers of the New York State Aviation Officials are: President, MAX J. POLLET, American Airlines at Albany; vice-president, W. D. GUTHRIE, Roosevelt Field; secretary-treasurer, JOSEPH FITZGERALD. Elections took place at the meeting held in Albany, Dec. 21.

» Whom the Army delighteth to honor: Distinguished Flying Cross to BRIG. GEN. HENRY H. ARNOLD for extraordinary achievement while commanding a flight of ten airplanes from Washington, D. C. to Fairbanks, Alaska and return, from July 19, 1934 to Aug. 20, 1934 . . . to CAPT. DONALD W. BUCKMAN (posthumous) for "heroism while participating in an aerial flight from March Field, Cal. to Bakersfield, Cal., Nov. 12, 1935" during which he effected a safe landing while suffering a severe heart attack, from which he died shortly afterwards . . . to MAJOR BARNEY M. GILES, LT. JAMES H. PATRICK, JR., SGT. DONALD E. HAMILTON, CORP. FRANK B. CONNOR, for rescue of seven CCC youths stranded on an ice floe in Cape Cod Bay, Feb. 9, 1936 . . . to LT. RICHARD ALDWORTH, for choosing to deliberately crash his disabled plane in the surf rather than imperil the lives of a throng gathered on the beach, in 1926.

» The War Department selected BRIG. GEN. HENRY C. PRATT as permanent general officer with recommendation for his appointment as a permanent brigadier general of the line, effective Jan. 1. General Pratt is the first Army Air Corps officer to achieve this status. Hitherto the Air Corps has been too new a branch for its officers to have had the length of service necessary for eligibility to the appointment. The General was appointed a Second Lieutenant of Cavalry in 1904, was transferred to the Signal Corps for duty with the Aviation Section in 1917, and on March 10, 1935 assumed command of the Second Wing, GHQ Air Force, Langley Field, where he is now stationed.

» Long known to readers of the aviation department of the *Boston Evening Transcript*, its editor, GEORGE MASON, is now turning out publicity and advertising for United Air Lines. Mason was also formerly publicity man at Boston Municipal Airport. His new job takes him to Chicago.

» 1937 set-up of the National Aeronautic Association: President, CHARLES F. HORNER; assistant to the president, MAJ. FRED L. SMITH; vice-president, FRED C. CRAWFORD of Thompson Products Inc.; secretary, H. F. RAND of New York City; treasurer, COL. JOHN H. JOUETT of Fairchild Aircraft Corp. District vice-president: 1st district GEORGE W. MASON, JR., Boston; 2nd district, GILL ROBB WILSON, New Jersey; 3rd district, RALPH W. HOWE, Richmond; 4th district, REGINALD V. WATERS, Miami; 5th district, FRED L. SMITH, Columbus; 6th district, COL. J. LAFETON WHITNEY, Chicago; 7th district, DR. JOHN D. BROCK, Kansas City; 8th district, CHARLES W. SHORT, JR., Tulsa; 9th district, W. P. BALDERSTON, Los Angeles. C. S. (CASEY) JONES was elected governor-at-large, and those re-elected were ORVILLE WRIGHT, GODFREY L. CABOT, GENERAL HENRY H. ARNOLD, BERNARR MACFADDEN.

» Air line changes: At TWA's new office in Dayton, C. L. KAUDERER handles east-west service as transporation and passenger agent. . . . Preparatory to inauguration of an Indianapolis-Detroit service, American Airlines has installed RALPH RADCLIFFE, JR., at Indianapolis as city sales manager. . . .D. H. ROTROFF has been transferred from Jackson to Memphis as district traffic manager for Chicago & Southern Air Lines. BURRELL WEBER succeeds him at Jackson. . . . At Tulsa, R. A. POWELL took over the station managership for Hanford Airlines, having heretofore been berthed at Omaha. . . . LEWIS W. KING steps up from assistant district manager for American Air Lines at Chicago to district sales manager, replacing CHARLES A. SPEERS who becomes district sales manager at Detroit.

» COL. CHARLES WAYNE KERWOOD, chairman of the Aviation Committee of the Advertising Club of New York, was elected commander of Air Service Post 501 of the American Legion, succeeding HARRY A. BRUNO. Col. Kerwood flew with the Lafayette Escadrille during the World War and is president of the American Section of the Ligue Internationale des Aviateurs. L. E. ORLANDO and MAJOR E. E. ALDRIN were elected vice commanders. Guest of honor at the meeting was COL. WILLIAM A. BISHOP, V.C., former R.F.C. flier, now Canada's Vice Air Marshal.

» After some months abroad surveying European airlines, LESLIE P. ARNOLD has joined the staff of Pennsylvania-Central Airlines as assistant to its president, C. Bedell Monro. Arnold joined the Army Air Corps in 1917 and in 1924 was one of the group of army fliers to make the first round-the-world flight. Resigning from the Army in 1929, he became affiliated with TAT-Maddux Airlines, later becoming assistant to the president of Transcontinental & Western Air.

» Gulf Oil Corporation is proud of its vice-president, B. P. NEWTON, upon whom King Leopold III of Belgium has conferred the decoration "Chevalier de l'ordre de Leopold." Mr. Newton is foreign representative of Gulf, with offices in Pittsburgh.

» When in 1907 E. A. HECKER joined Wells Fargo as a driver, it is not likely that he forsaw that thirty years later the airplane would have supplanted Old Dobbin as a carrier of express. The years have taken him through all the branches of express, until, in 1932, he was made superintendent of organization for the Railway Express Agency. In March, 1936, he became superintendent of General Air Express, a division of Transcontinental & Western Air. He has now been promoted to express traffic manager.

» The career of HARRIS M. HANSHUE, who died in Los Angeles on Jan. 8, reflects many phases of air transport history during the past decade. From automobile racing and the sale of automobiles, Mr. Hanshue turned to air transport in 1925, organizing and becoming president of Western Air Express, then carrying mail between Los Angeles and Salt Lake City. The operation expanded, and in 1930 Western Air Express and Transcontinental Air Transport combined to form Transcontinental & Western Airlines, Inc., with Mr. Hanshue as president. He resigned after cancellation of the air mail contracts in 1934. Recently he had organized the Waterman Airplane Company of California. At various times Mr. Hanshue had been president of Fokker Aircraft Corp., a director of the Pacific Zeppelin Transport Co., and a director of National Aviation Corporation. He had also been vice president for the Northwestern Division of the Aeronautical Chamber of Commerce.

» From far corners come aviation visitors: MAJOR PERMA LIMPIVASTI of the Royal Siamese Air Force at Bangkok is visiting aircraft and engine factories in the U. S., as guest of Wright Aeronautical Corp.

The Aviation Viewpoint in AIRCRAFT RADIO

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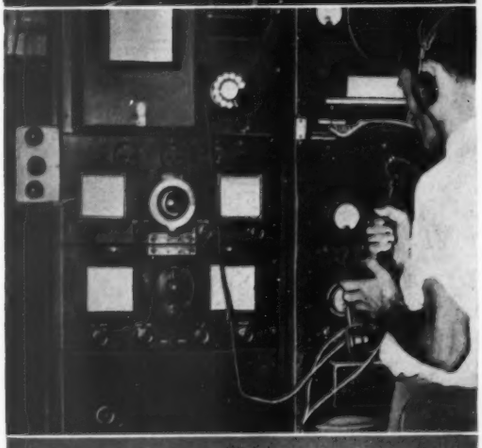

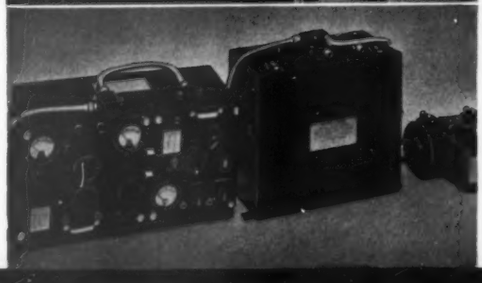

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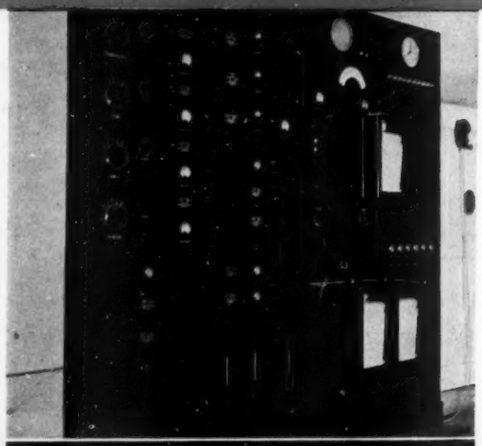

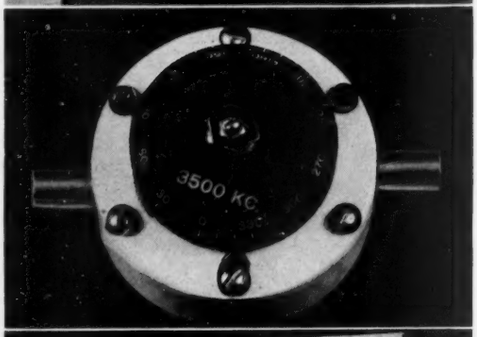

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Photos Courtesy U. S. Dept. Commerce

Britain's New Airways

(*Continued from page 25*)

sidy from the home government, supplemented by further subsidies from Colonial and Dominion governments, by a substantial share of the post office's income from air mail postage, and by assistance from the Air Ministry in aircraft development costs. With an outstanding capital of approximately 2,500,000 dollars the company has long earned an annual profit and paid rather good dividends. The Air Ministry shared in the original capitalization, is represented on the board of directors by two members, and maintains intimate contact with the company.

The present subsidy agreement between the company and the government of the United Kingdom expires in 1938. In the early years of the company it was based directly on mileage flown. Later it was modified to a horsepower mileage arrangement to encourage the operation of larger ships. Total direct subsidy received by the company in 1935 was approximately $2,850,000, of which almost 30 per cent represented contributions from the government of South Africa.

"Extending Empire air routes" has been—politically—no bed of roses for the "chosen instrument." Long campaigns of negotiations were required for every forward step. France and the Netherlands, for example, extended permission to operate over France and the Netherlands East Indies only in exchange for reciprocal privileges across British territory. Persia has never given permission for British operations over its territory. Italy has raised one obstacle after another.

Apparently, too, Imperial has had slow going even in dominions and other semi-autonomous units of the Empire itself. Frequently it has been necessary to organize a subsidiary in each dominion concerned.

COMPETITION from the airlines of other nations has also raised serious problems for Imperial. France and the Netherlands, motivated by the same desire to knit their colonial empires more closely, matched Great Britain step by step in extending air routes to southern Asia.

Finally (1935), the North Atlantic came to weigh heavily on the minds of Imperial officials. As early as 1930 Pan American Airways had started actual progress toward a trans-Atlantic service by establishing a route from Boston to the Maritime Provinces. Too burdened elsewhere to match such activities at the time, Imperial secured a postponement of further Pan American aggression by negotiating an agreement to the effect that Pan American and Imperial would eventually share on an equal footing any trans-Atlantic operations undertaken by either. The development in America of the Sikorskys and Martin Clippers, therefore, put England in the position of being solely responsible for trans-Atlantic delay. Then last year Germany jumped the gun with its Zeppelins and catapult-planes.

All added, Imperial Airways found itself, in 1935, with a fleet of less than fifty outmoded airplanes strung out along a 20,000 mile network. Its routes to India and Africa were vulnerable to every whim of a half dozen countries with policies shifting back and forth in response to the vagaries of European politics. It was earning no orchids in the North Atlantic, it might well have undertaken a half dozen scattered projects of localized scope, thereby improving its situation temporarily. Instead, it is facing the world with its present really adequate program for expansion.

ITS EQUIPMENT PLANS are really magnificent. Altogether there are some 40 new planes already delivered, or expected during 1937. Of these, 28 are 18-ton flying boats from the Short Brothers factory in Rochester. Powered with four Pegasus engines of 740 hp. each, they will have accommodations for 24 passengers on day stages, 16 on night journeys. They will have a crew of five, and capacity for big mail cargoes, at least on flights up to 1000 miles. Their top speeds have been announced as 199½ miles per hour.

Twelve of the ships on order will be four-engined Armstrong-Whitworth "Ensign" land planes equipped for 27 day passengers and 20 at night. The total horsepower of their four Tiger engines is 3200. Their top speeds are to be "somewhat over" 200 miles per hour. Also under construction is the odd Short-Mayo composite. The latter consists of two flying boats designed to take-off when fastened together into a single unit. Once in the air (at a suitable altitude), the two ships separate, the heavily loaded top component proceeding to its distant destination with its cargo, the larger "taker-offer" returning to its base of operations.

(*Turn to page 71*)

Air Bumps

(*Continued from page 33*)

Though the regulatory authorities presumably will not be abrupt in acting on the matter, the suggestion is plain that existing rules are far too severe for machines of light loading. If a calculated ability to support a gust of 60 ft. per sec. true velocity is taken as having been demonstrated by experience to be quite sufficient, especially in conjunction with the hidden reserves, (redundancy and hysteresis) transport planes and bombers should continue to be designed for an effective gust of 30 ft. per sec., as in the past. For the typical private-owner cabin plane, however, 24 ft. per sec. would seem sufficient; and for a really light plane, only a 15-ft. effective gust would be required. Since such gusts as those would require load factors absurdly small, as compared with those needed for even the gentlest maneuvering, the indication is plain that for machines with a wing loading of less than about 12 lb. per sq.ft. the gust-loading basis of specifying load factors is a misleading one. For airplanes of that class, even if not designed especially for acrobatic performance, maneuvering loads should be restored to regulatory pre-eminence.

Before the full meaning can be drawn from these studies with respect to very large airplanes, more must be known of the probable dimensions of the full-velocity core of a gust. It seems quite probable that the strength begins to diminish, as the gust is traversed, very soon after its maximum is reached; that the transverse velocity curve has in fact the form of a wave; that a large airplane may therefore be expected always to escape having its full span subjected to the gust's fullest intensity at the same instant; and that the loads on the wings of such a machine may be substantially reduced thereby. There is the next field for research.

What ship do you fly ?

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More good news! — Additional plant facilities and advanced production methods have enabled us to make substantial manufacturing savings which we are glad to pass on to purchasers of Switlik Chair Chutes in the form of a price reduction. At present costs, no cabin ship owner should deny his pilot and passengers Switlik's parachute protection in emergencies. Ask the manufacturer of your plane — new or used — for complete details.

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SWITLIK PARACHUTE & EQUIPMENT CO. · TRENTON, N.J.

Britain's New Airways

(*Continued from page 69*)

Several of the Short Empire boats have already been delivered and have been extensively flown. Another arrived early in January at Bermuda neatly crated on the deck of a steamer and is in the process of assembly. Two more are being fitted in England for an early inaugural of a service between that island and New York. Two more are being fitted in England with large extra tanks to enable them to take part in pioneering trans-Atlantic flights early this summer, and of course the Mayo boats may likewise appear over the Atlantic during the coming season.

BUT the Atlantic is by no means the sole or even the principal objective of Imperial's building. There is scarcely a mile of its present system for which plans have not been made to utilize the new four-engined ships. The Mediterranean is, of course, an ideal sphere for action. Immediately they eliminate entirely England's political dependence. If arrangements with Italy are not entirely satisfactory, the big planes can proceed directly across France from England to Marseilles, thence to Greece and Egypt by way of Malta, a British possession. If France, too, raises difficulties, a practical route could be laid out from England down the Atlantic coast to Lisbon or Gibraltar. Henri Bouché, in a recent issue of *l'Illustration*, called attention to the fact that even if Great Britain were to be cut off from the entire Mediterranean it would be practical, if somewhat inconvenient, for Imperial's flying boats to continue southward from Gibraltar along the West Coast of Africa, then across just south of the equator to the Indian Ocean, with permission necessary only from Belgium or Portugal. No such reroutings, of course, may ever be necessary. But their possibility adds immeasurably to the strength of the British position.

Beyond Cairo the Empire boats are to be no less important. By April 1 enough are expected to be available to put the entire route to South Africa on a flying boat basis. Up the Nile, via the White Nile and one of its tributaries, the ships will make their way to Lake Victoria. From there, instead of following the present route which lies some 200 miles in from the seacoast, they will turn southeastward and fly along the edge of the Indian Ocean to Durban in South Africa. Meanwhile it is planned to have the South African Airways run local services over the present land route south of Lake Victoria. The Cairo-Australia service is likewise to be put on a flying boat basis, lakes and rivers being utilized for stops near Bagdad and across India. On the Singapore-Darwin stages they are obvious improvements over the land planes now in use. In the near future, too, they are slated to start operations between Australia and New Zealand.

TO MEET the heavy cost of all this equipment, Imperial, with the approval of the Air Ministry, is increasing its capitalization to approximately $10,000,000. Before undertaking the building program it is understood to have reached a close general agreement with the government on the terms of a new 15 year extension of its subsidy contract. The basic direct subsidy is not, however, to increase materially. What is to change the income side of Imperial Airways' ledger are payments for services rendered to His Majesty's Post Office. Which brings us to the Empire Air Mail Plan. . . .

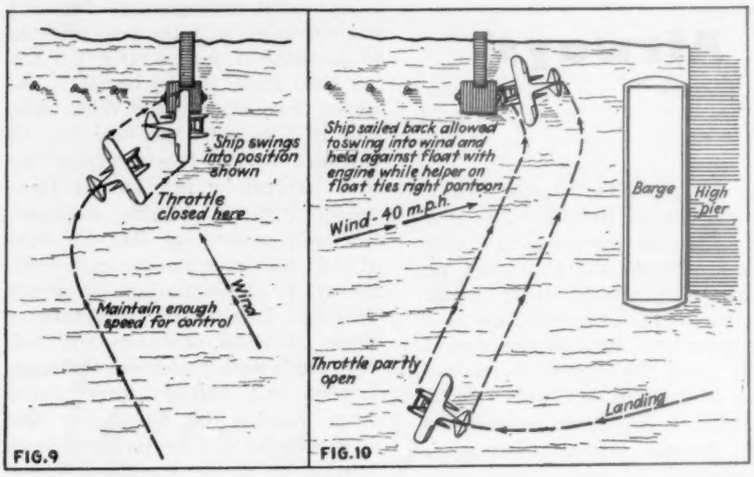
For many years, air mail loads, even on the long empire routes, ran very light by American standards. Then successive reductions in postal surcharge sent them steadily upward. Last year, doubling of frequencies over most of the system and a postal rate of 6 pence (12 cents) per half ounce to Capetown or to India, increased loads to the point of seriously limiting passenger capacity on trunk routes. Now it has been announced that starting April 1, all mail from the United Kingdom will be carried to South Africa via the new seaplane service at the regular unsurcharged postage of three cents per half ounce.

Just what arrangements Imperial has concluded with the post office as to its share of such a tariff has not yet been made public, but it is assumed to be substantial. What loads will be like once the new rate is extended to the entire empire has been forecast by Mr. Dennis Handover, Imperial's traffic manager. "Actually something like 20 tons of mail will leave London each week by air, or the equivalent of nearly 2,000,000 letters from this country alone. Normal schedules will call for twice-weekly service between London and Sidney; three planes from London to Singapore; five from London to Calcutta; nine from London to Egypt; London-Kisumu, three, and London-Durban, two with provisions for connections to China and West Africa. Christmas periods will necessitate the use of about 40 large aircraft, day and night, backward and forward, for about four weeks. . . . The increase in mail will involve the readjustment of division of space on aircraft between mails, passengers, and freight. Whereas now, passengers generally outweigh mail and freight, in the future, mail will outweigh passengers and freight."

The Undersecretary of State for Air, in describing the plan to the House of Commons, said that the ultimate aim was to achieve a two and a half day schedule to India and to East Africa, a four and a half day schedule to South Africa and to Singapore, and a six-seven day schedule to Australia. Such schedules, of course, even with the new cruising speeds, will require a wide development of night flying. This is by no means the least revolutionary part of the whole program.

WHAT an astoundingly bold project this is! How splendid, that in the midst of a frantic attempt to make up lost ground in the European race for European military air supremacy, the British government has had the vision to authorize the diversion of manufacturing facilities for the construction of so great a commercial fleet. Incidentally, they are likewise permitting Imperial almost to double its flying staff in spite of the severe shortage of pilots for the Air Force. (In a way, of course, the air mail plan has much to justify it as a defense measure, for it is inconceivable that such a process of space destruction could fail to have

(*Turn to page 75*)


Ship swings into position shown
Throttle closed here
Wind
Maintain enough speed for control
FIG.9
Ship sailed back allowed to swing into wind and held against float with engine while helper on float ties right pontoon
Wind - 40 m.p.h.
Barge
High pier
Throttle partly open
Landing
FIG.10

Seaplane Handling

(*Continued from page 29*)

no help available. If the float is being used regularly, old tires should be hung along the sides to protect the pontoons. Fig. 9 shows an approach to the same float with the wind in a different direction. Fig. 10 gives a third condition, once encountered by the writer at night, with a wind velocity estimated at 35 to 45 m.p.h.,—much too high to risk turning. In this last case, since the one door of the ship was on the left side, the passengers *had* to get off over the bow. This, however, could be considered more or less of an emergency, as with one pontoon (the right) tied fast, it took three men, hanging onto a line from the bow of the other, to hold it in to the float. The nose-on approach was the only one possible.

The ideal approach to a float is that in which the ship can be taxied approximately into the wind but along one side of the float. An L-shaped float, without nearby obstructions, renders this procedure possible in three out of the four general wind directions. In the case of a ship equipped with wingtip pontoons, however, it is almost essential that there be an assistant on the float to lift the wing as the ship comes alongside as otherwise the tip pontoon will be damaged.

In approaching any float or dock where there is a strong current, such as is found in tidewater rivers, the current must be taken into consideration. In such cases, the ship will weathercock into the wind but unless the wind velocity is fairly high, the travel will be with the current instead of with the wind. It is extremely disconcerting to a pilot who has never run into this situation to find himself, as he thinks, all set to sail back before the wind but instead bearing down at a good rate of speed onto a flock of yachts or other obstructions. There isn't much he can do about it either unless he has room enough to start the motor and turn, which is seldom the case. To determine which way the ship is likely to move after it is on the water, note the boats which are at anchor. The airplane will probably move toward the stern of the boats, regardless of what direction the nose faces. If no boats are in sight, see if there are any spar buoys and determine in which direction they lean. Unless the wind is very strong, the ship will move in that direction. If there are neither boats nor buoys, enough room should be left to determine the direction of the current before getting into a restricted space.

The approach to a dock or pier, assuming that it is higher than the wing, must be nose first and the passengers will have to get in or out from the bow. If the wind is not directly at ninety degrees to the side on which the approach is made, a line from the windward float should be passed to someone on the pier and pulled up tight. Otherwise the ship will swing and the leeward wing will strike against the pier.

The ideal approach to a beach is when the wind is onshore, and the beach is sandy with a steep slope. The ship may be taxied fairly close, the switch cut and the water rudders lifted. The plane will then swing into the wind and sail back onto the beach. The pilot may then go out off the stern, lift the tail and drag the ship back, which will leave the rear end of the floats high and dry. If the wind is off-shore, it will be necessary to taxi right onto the beach, and the pilot will have to get out over the nose with a line fastened to the mooring cleat before the ship drifts back. If the ship is an amphibian and the beach is firm, the procedure, of course, is to put the wheels down and taxi completely out of the water. Unless the pilot is sure of the character of the shore, however, this maneuver should not be attempted, as getting stuck in the mud, half in and half out of the water, is an embarrassing predicament, particularly if the tide is running out. If there is any doubt about the solidity of the bottom, the wheels should be left up and the approach made as with a seaplane. In any case, take care not to be caught by the tide. If this should carelessly be allowed to happen, there are only two things to do: wait for the tide to come in, or skid the ship into the water on planks *laid crosswise* and thoroughly wetted. Somebody will have to get his feet wet.

In leaving a beach, float, or pier, patience again comes into play. If the wind is on-shore, or toward the side of the float or pier at which the plane is lying, and all is clear in front, obviously the only thing necessary is to give her the gun. However, as is probably more often the case, if the wind is blowing from the point to which the ship is fastened, the lines should be cast off and the plane allowed to sail back, away from the landing point, until there is *ample* room to turn and taxi out, at which time the motor may be started.

ONE OTHER POINT should be mentioned and that is the matter of transferring passengers to or from boats. In calm water the boat should be brought up from the rear, but in rough water a large boat should be brought across the bows of the pontoons and a line passed from the bow of the motor boat around the mooring cleats on both pontoons and then to the stern of the boat where it is pulled tight.

AL WILLIAMS CHOOSES
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Say, how about pulling the old brain out of a spin and sending me some news from your neck of the woods. We can always use more gossip, strange happenings and whoppers for this page. And the rest of the fellows will be tickled to hear from you. Send the billet-doux to:

MAJOR AL WILLIAMS, *Manager, Aviation Department*, Gulf Aviation Products, Gulf Building, Pittsburgh, Pa.

YOU'D HIDE OUT, TOO

"A popular official of a well-known plane company was bragging to a bunch of the boys about the reliability of the compass installed on his particular make of ship.

" 'Why,' he said, 'The other day I set out on a 180 degree course for Oshkosh*, held the ship directly on the compass-reading, and two hours and five minutes later hit Oshkosh right on the nose.'

"Well, the boys found this hard to swallow, so they went out to check the compass. I'm a son-of-a-gun if the compass hadn't been stuck since its installation thirty days before, and all the instrument experts at the factory couldn't unstick it.

"The result—he had a new compass installed in his ship and has been awfully hard to find ever since."

***For real name of town (and name of official, too) write Al Jones, 725 Eighth Street, Hickory, N.C., the contributor of this yarn.**

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Together, Gulfpride Oil and Gulf Aviation Gas are used on an overwhelming majority of the scheduled air miles flown by airlines operating exclusively in territory East of the Mississippi . . . the territory where Gulf products are sold. A swell oil. A swell gas. A swell record.

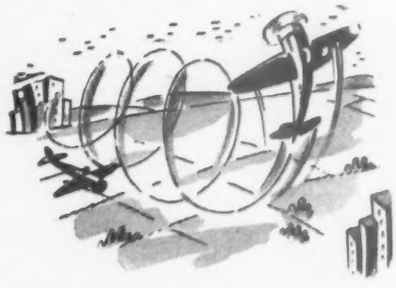
THE DIZZIEST GUY ON EARTH

This story sounds nuts to the editors, but the narrator swears it's true. Can any one give us the real lowdown on it?

It's about a mail pilot who used to be on the Chicago to St. Louis run. For months he arrived on schedule and his reputation as a flier was ace-high. Then one day he reached St. Louis half an hour late. The next trip he was an hour late. The next one, an hour and a half. And then he began pulling in regularly about two hours behind schedule.

The officials began to wonder if he didn't have some girl whom he was courting on company time. So one day when he left Chicago, they sent a ship to trail him.

Our pilot took off nicely and climbed to about 15,000 feet. Then he went completely screwy. He looped the ship for



no apparent reason. As soon as he'd completed this loop, he looped again. And again. And again. All the way from Chicago to St. Louis, he kept it up, till the pilot trailing him got dizzy watching.

He landed in St. Louis two and a half hours late, reeled out of the cockpit, and yelled, "I've done it, boys, I've done it. I've looped a plane all the way from Chicago to St. Louis. Now I can retire happy."

And retire he did. Just before the company beat him to it.

THOSE SMART FRENCHMEN

Sixty one years ago this month—27 years before the famous flight at Kitty Hawk—two up-and-coming Frenchmen filed a patent for an airplane.

It was to be a low wing monoplane with two variable-pitch, metal propellers, placed in the leading edge; a fixed horizontal fin; double vertical fins; rudder and rudder bar; closed fuselage; tail skid; *and even a retractable landing gear.*

Sounds almost like the specifications for a speedy ship of today, doesn't it? Even if the plane never did get off the ground, we say "hats off" to these forward looking inventors.

THIS MONTH'S WHOPPER

"One afternoon this fall just before the lakes up here in Canada started to freeze, we were trying to finish a job of survey.

"Well, we were flying along nicely when, blooie, the old boiler quit. So we looked around for a spot to sit down, and could see nothing but a small lake below. So down we went.

"We found our gas tanks dry, so we went ashore and slept till dawn. Only to find that the lake had frozen over and that our floats were stuck solidly in the ice.

"Rummaging around, I found a small bottle of Gulf Aviation Gas, which I occasionally use as a gargle and mouth wash. So we poured this gas in the tank and started the motor, hoping to break the ship free from the ice.

"When we gave her the gun, the old girl jumped straight in the air and cleared the trees on the shore by at least four hundred feet.

"And was I amazed to look down and see the whole lake still frozen to my pontoons and being carried along in the general direction of Yuma, Arizona.

"Now if you think I am lying, you can check and see where a rain fell out of a blue sky 700 miles Southwest of this lake and saved a wheat crop from drought. You see, a bright sun finally melted the ice."

—Al Cheesman, Port Arthur, Ontario

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF AVIATION PRODUCTS

Britain

(*Continued from page* 71)

a tremendously beneficial effect upon Empire ties and loyalties.) In any case, even in its intra-empire implications, the experiment will be a fascinating one for the world to watch through coming months.

Even more stimulating is speculation upon the impact the success of such a project is bound to have upon the air transport systems of other nations. Obviously, the directly competing lines of K.L.M. and Air France are faced with the immediate prospect of a demoralizing competition unless they, too, slash air mail surcharges to the vanishing point. Later the demand for "free" airplane carriage for all first class mail will be certain to raise its head once more in every air-conscious country on the globe. In most cases there are excellent reasons why such carriage is impractical for years to come. A British success will make such reasons no easier to defend.

How Far?

(*Continued from page* 31)

airplanes, these engines may possibly encounter serious competition from some new type of engine), but the final result must certainly be a much better fuel economy than is possible at present.

Fig. 3 is a plot of Breguet's formula for maximum range, and shows fuel and oil weight ratios required for various maximum ranges, as a function of a single parameter $\frac{\eta}{c}\left(\frac{L}{D}\right)_{max}$ which combines the three separate parameters of propulsive efficiency, specific fuel consumption, and maximum lift-drag ratio. A value of 30 for this parameter is possible at present, and a value of 70 would seem to be not unreasonable to be approached in the future.

In light of the above, it appears to the authors to be not at all impossible to expect that there may some day be built an airplane capable of a 20,000 kilometer (12,450 mile) range, i.e., one which could fly nonstop to any point on the earth's surface. Aids to long range would undoubtedly be required. One would possibly be an inclined runway or a tow-cable for take-off. Such a ship would be very large, due both to the fact that an enormous fuel load would have to be carried, and to the fact that, apparently, the weight-ratio efficiency increases with increasing gross weight. It would therefore be a multi-motored ship. so that another long-range aid would be available in that a pair (or pairs) of symmetrical engines could be cut out and their propellors feathered over the last portion of the flight.

Design for the absolute ultimate in long-range performance predicates, in general, comparatively low speeds. This may be satisfactory for record-breaking flights or for special military missions but it remains an incontestable fact that in sacrificing speed there is sacrificed the one inherent advantage of aircraft over other means of transportation. From a practical point of view, long range must finally be combined with high speed—and the answer lies in the higher altitudes. While maximum range may not be increased by flying at heights above the critical (i.e., rated) altitude of the particular engines installed in a given ship, the speed for maximum range increases with altitude, and all that is required from the performance viewpoint is that cruising power be maintained, by appropriate supercharging, to the optimum altitude.

The particular problem of supercharging to great heights will be taken up in the concluding article of this series. Neglecting supercharging difficulties, then, we come to the consideration of some relations, (one of which was introduced in the previous article), which are not only merely interesting in that their form is rather surprising but in that, intelligently used, they point the way toward bridging the gap between long range and high speed. These equations give the components of the indicated speed for maximum lift-drag ratio,

$$V_{LDI} = \sigma_{LD}^{1/2} \times V_{LD} = 14.85 \frac{W^{1/2}}{b_e^{1/2} f^{1/4}};$$

that is,

$$V_{LD} = 332.4 \frac{\eta P}{W} \frac{b_e}{f^{1/2}}$$

and

$$\sigma_{LD} = \frac{0.664 W^2}{b_e^2 \eta P V_{LD}} = \frac{0.002 W^2 f^{1/2}}{b_e^2 (\eta P)^2}$$

The expression for V_{LD} shows, for a given η, P, W, b_e and f, the maximum possible speed attainable, and the expression for σ shows, indirectly, the altitude at which this speed is attained (a curve of σ against altitude was shown in the previous article). Care must be exercised in the use of these equations, particularly in the matter of the effect of altitude—i.e., the effect of compressibility and kinematic viscosity on f, and of compressibility on η, as was mentioned in the previous article.

The true speed, V_{LD}, for maximum lift-drag ratio varies for a given W, b_e and f, as $\sigma^{-\frac{1}{2}}$, so that a 25 per cent increase over the sea-level speed is gained at 14,500 ft. standard altitude, 50 per cent at 25,200 ft., and 75 per cent at 33,600 ft. The high-speed long-range (high-altitude) airplane of the near future must affect a compromise, to be sure, but consideration of the above cannot be neglected. The actual attainment of great heights will be taken up in the concluding article.

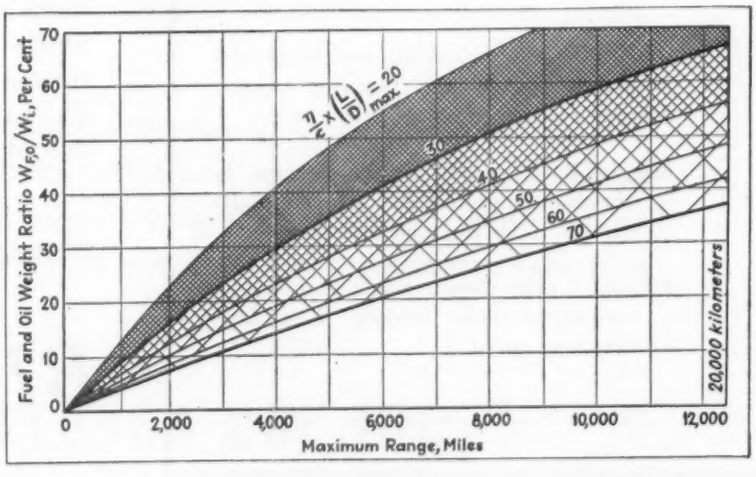


Fig. 3—Fuel and oil weight ratios required for various maximum ranges

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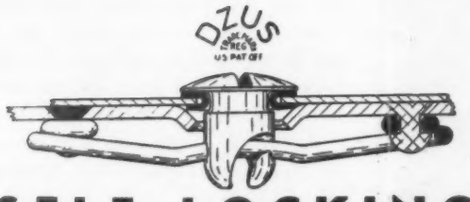

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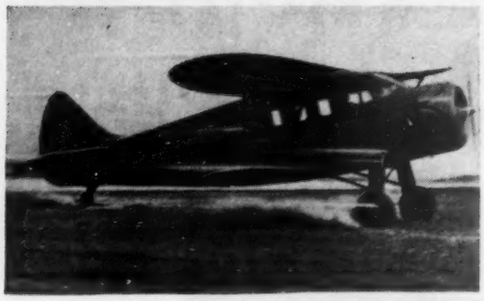

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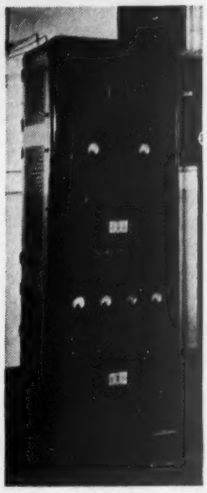

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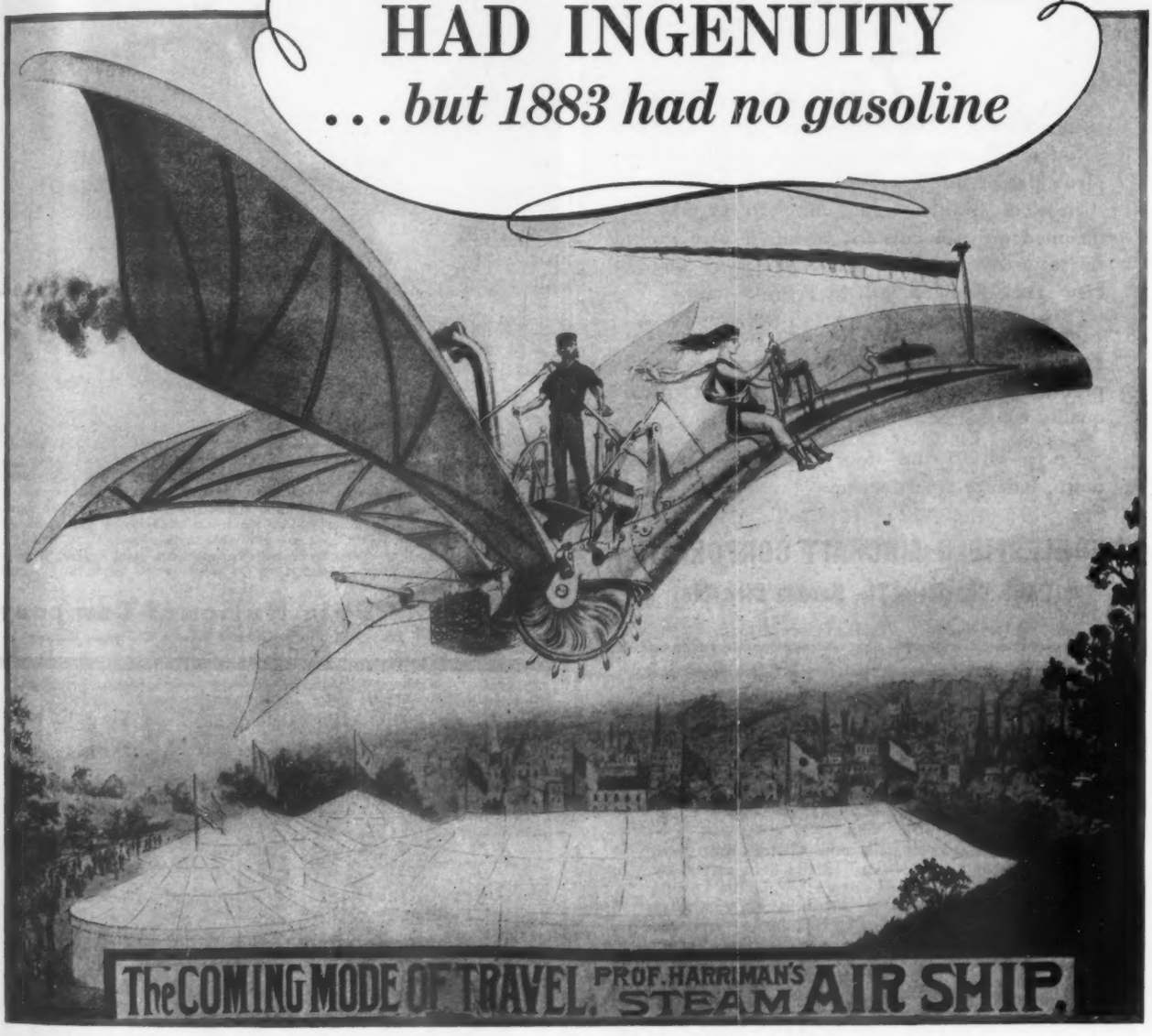

Illustration above from a circus poster drawn in 1883 by Emil Roe and now in the Bella C. Landauer Collection. Certainly in those days it must have been daring . . . as well as fanciful. Imagine the sensation aroused by the modern bathing-beauty uniform of the attractive co-pilot!

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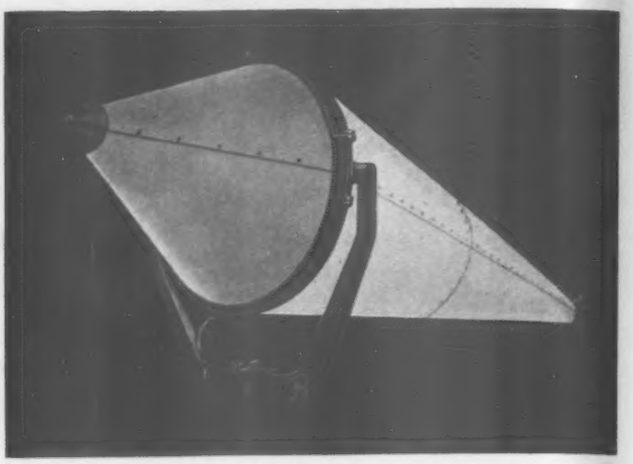

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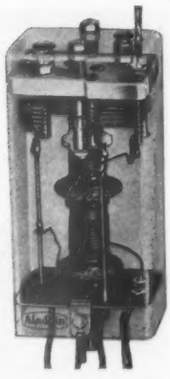

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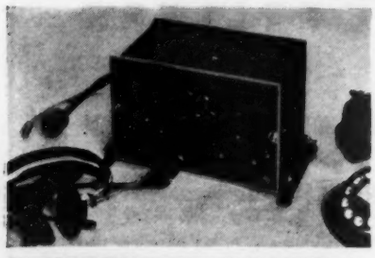

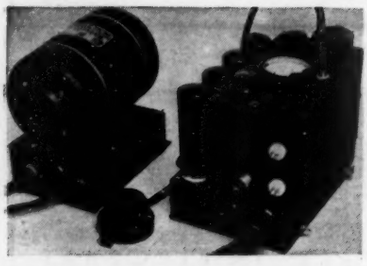

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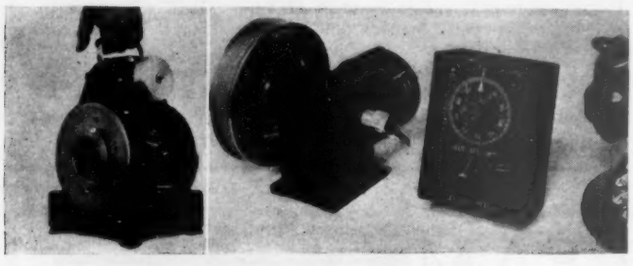

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Planes, Engines & Parts For Sale

Indexed—See page 87

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DELUXE REARWIN, 85hp LeBlond, Demonstrator. Like new, less than 100 hours, extra equipment, forced to sell at sacrifice. J. A. Wales, Jr., 230 Park Avenue, New York City. No. 10

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SURPLUS AIRLINE MATERIAL—Cleanup for —J5 and J6—Wasp and Cyclone Parts—New and used — Write your requirements — Save dealers' profit. Box 568, Miami, Florida. No. 12

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ENGINES AND PARTS for sale. Liberty 400 hp.; Hispano E 180 hp.; also quantities of Pratt & Whitney, Wright, Curtiss and Packard engines. The Vimalert Company, Ltd., 841 Garfield Ave., Jersey City, N. J. No. 17

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GREAT LAKES—New—2T-1A-Serial No. 249-A.T.C. No. 228, Goodyear wheels, brakes International orange rubbed dope job—price reasonable. Aircraft Service, Inc., Municipal Airport, Cleveland, Ohio. No. 20

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FEBRUARY, 1937 ISSUE

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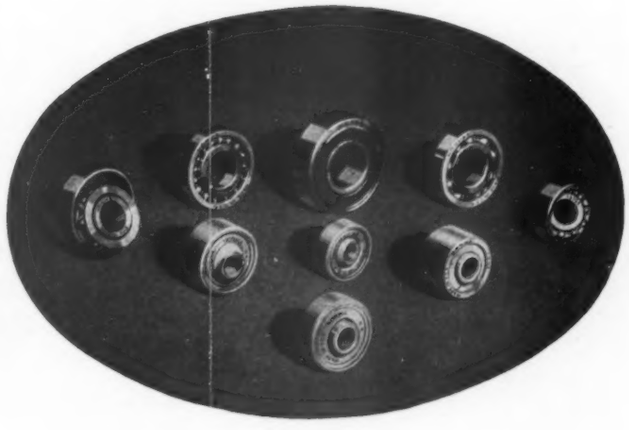

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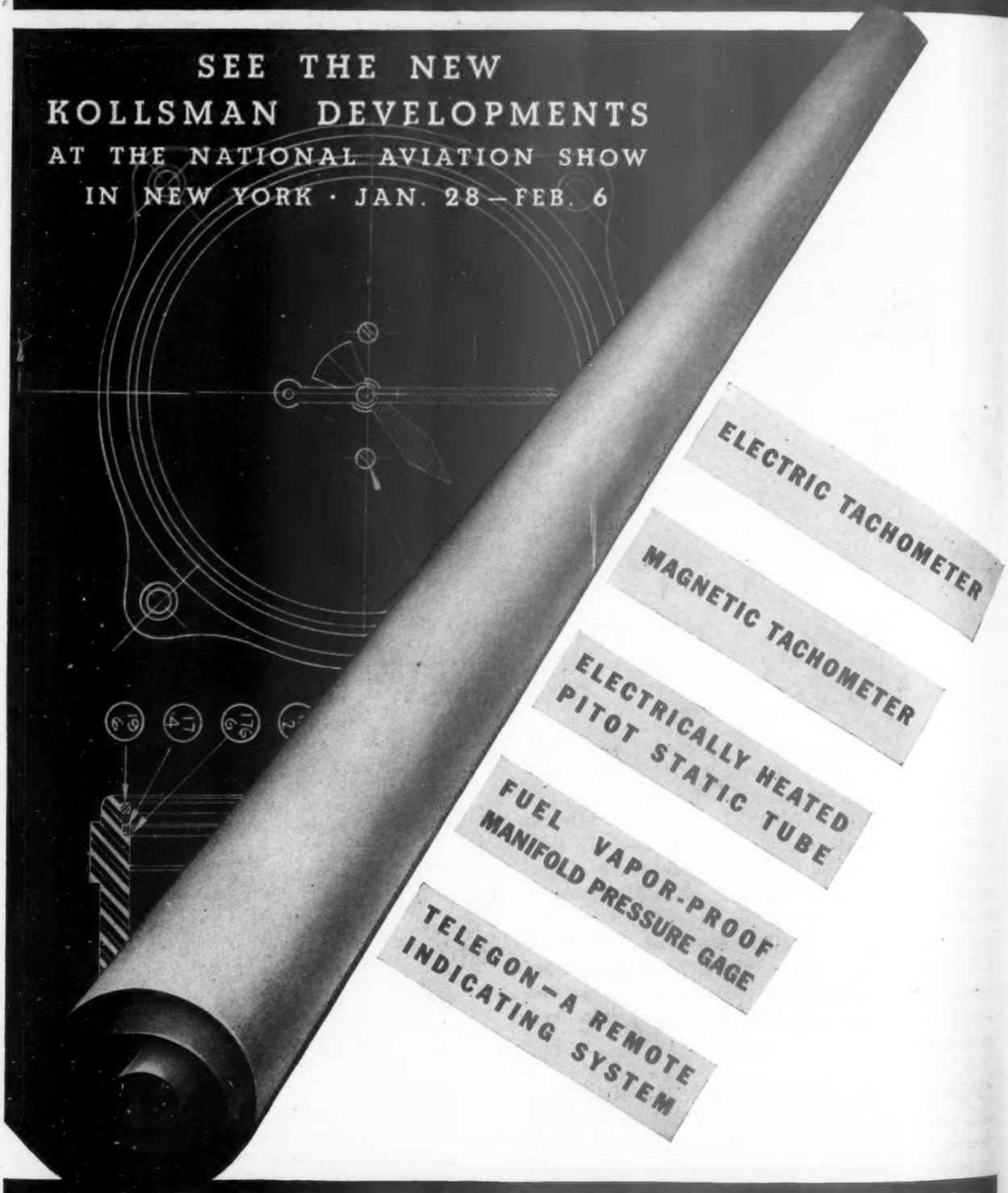

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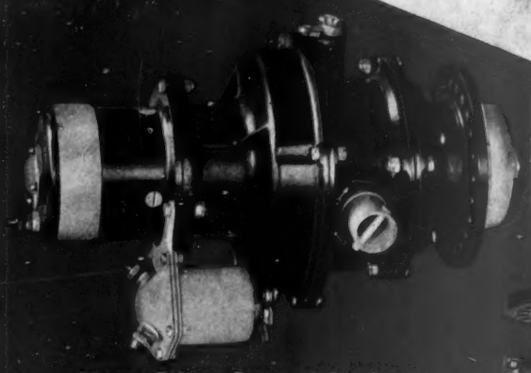

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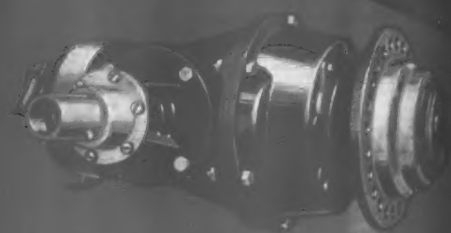

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